

A SYSTEMATIC STUDY OF THE GENUS BAHIA (COMPOSITAE)¹

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8. *Bahia schaffneri* S. Wats.

8a. *Bahia schaffneri* S. Wats. var. *schaffneri*

Bahia schaffneri S. Wats., Proc. Am. Acad. 26:142. 1891. Holotype examined (GH) : "Sandy plains near San Luis Potosí." May 18, 1889, San Luis Potosí, Mexico, C. G. Pringle 3028.

Plants annual, 5-15 cm. tall. Stems decumbent, more or less pubescent, spreading from a slender taproot, 2-3 mm. in diameter, the ultimate branches culminating in 1-5 monocephalic peduncles; peduncles 1-6 cm. long, pubescent (occasionally with stipitate glands near the involucre). Leaves opposite, becoming alternate in the upper branches, ternately 1-4 times divided into linear segments (the latter 0.2-1 mm. wide), 1-2.5 cm. long, pubescent, impressed punctate with globules of exudate within the depressions (occasionally the punctate condition is only barely perceptible). Mature heads (including florets) 5-8 mm. high, 10-15 mm. in diameter. Involucre broadly campanulate; involucral bracts sparingly pubescent (occasionally with stipitate glands) with globules of exudate few or absent, 8-14 in 1-2 series, reflexing with age, membranous margins occasionally purple, 4-5 mm. long, 1.3-2 mm. wide, lanceolate or oblanceolate with the apex obtuse or acute and the midrib weakly developed or absent. Receptacle flat, alveolate or fimbriate, 1.2-1.6 mm. in diameter. Ray florets 3-7, yellow, pistillate, fertile; ligule 2.6-3.5 mm. long, 1-2.3 mm. wide, oval (rarely oblong or ovate) with a notched or undulate apex; tube 0.2 mm. in diameter, 1.5-2 mm. long with few to numerous short stipitate glands. Disc florets 50-70, perfect and fertile, yellow, 2.5-3.5 mm. long; tube stipitate-glandular, 0.2 mm. in diameter, 1-1.3 mm. long; throat funnel-form-campanulate, 0.7-1 mm. long; lobes 5, reflexed at maturity, 0.5-0.8 mm. long, farinose on the inner surfaces; anthers 1-1.5 mm. long, partially exserted at maturity; style branches flattened, 0.5-0.8 mm. long with prominent stigmatic lines along the upper margins (occasionally only weakly discernible), reflexed at maturity, apices obtuse with papillose enlargements; achenes 2.2-3 (-3.5) mm. long, narrowly obpyramidal, 4-sided, brown to black, hispid on the angles of the lower quarter with hairs about 0.2 mm. long, hispidulous on the angles and the faces of the upper portion; pappus of 8 scarious, obovate scales; scales 0.7-1.5 mm. long, 0.5-0.9 mm. wide, thickened at the base but without midribs. Chromosome numbers, $n = 8$ and 10.

DISTRIBUTION: Calcareous loam and silty-clays of igneous

¹Concluded from page 215 (April-June 1964).

origin mostly on gravelly mesas and slopes in the states of San Luis Potosí, Zacatecas, Guanajuato and Aguascalientes, 5500-8000 ft. (Fig. 54). Principal flowering dates July-September.

As constituted here, *B. schaffneri* consists of two varieties: var. *schaffneri* and var. *aristata*. Rydberg (1914) recognized these taxa as two species, distinguishing the latter by the excurrent midribs of its pappus scales and by its absence of impressed-punctate foliage. I found all specimens of var.

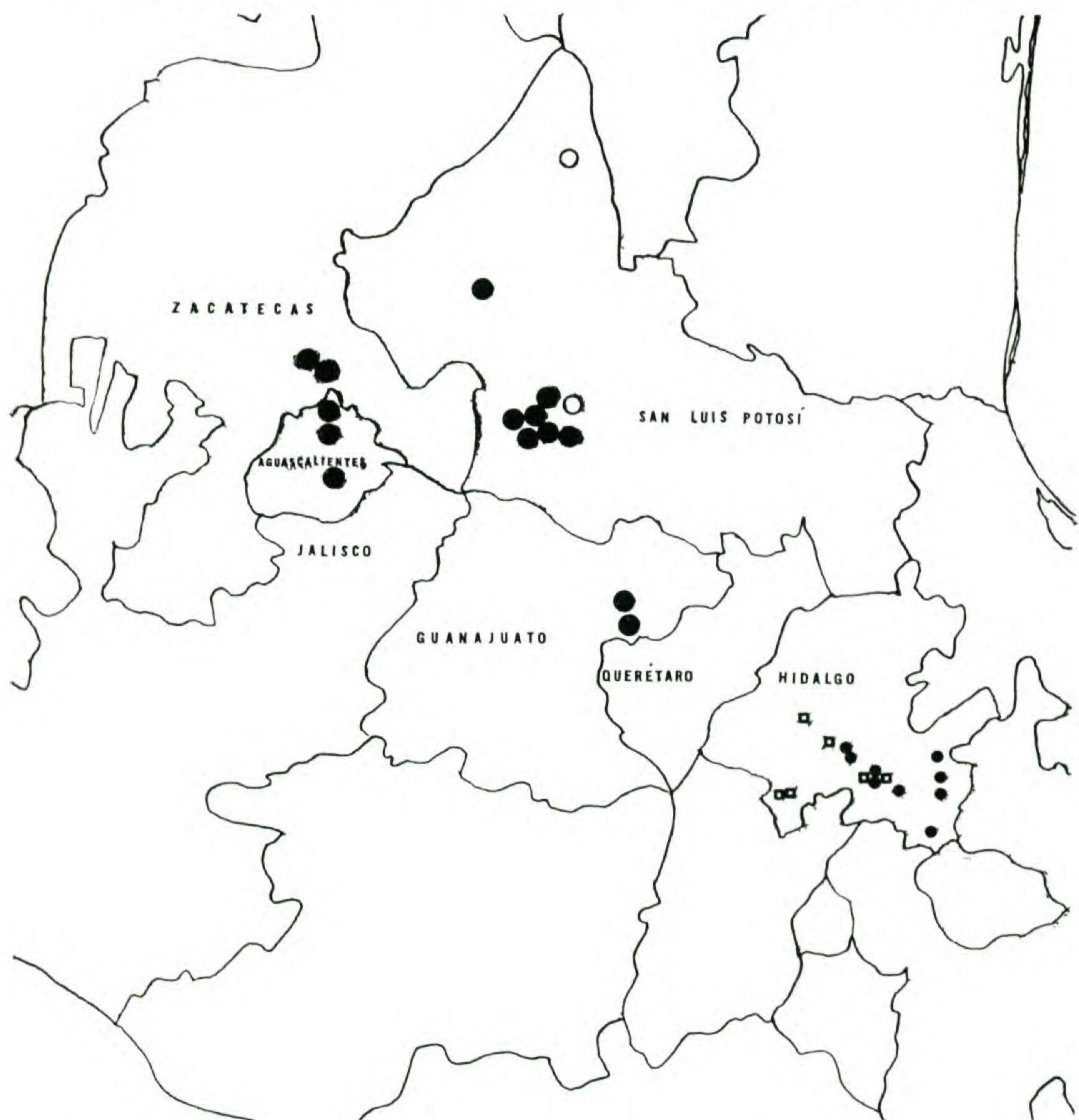


Fig. 54. Map showing distribution of *B. pringlei*, small open squares; *B. schaffneri* var. *schaffneri*, large closed circles; *B. schaffneri* var. *aristata*, large open circles; *B. xylopoda*, small closed circles.

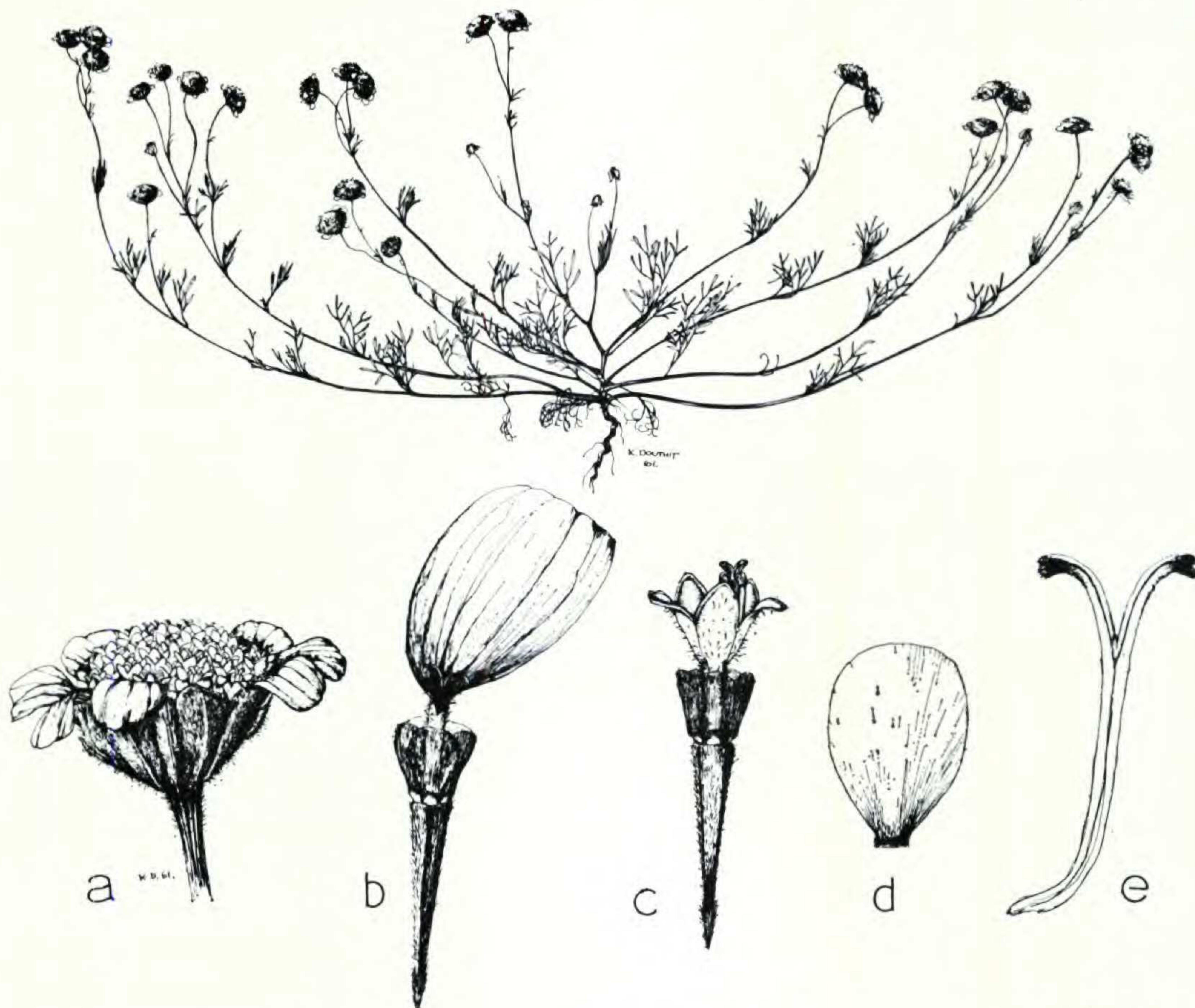


Fig. 55. *B. schaffneri* var. *schaffneri* (Pringle 3266, GH). Entire plant, $\times \frac{2}{7}$. a. Head, \times ca. 3. b. Ray floret, \times ca. 4. c. Disc floret, \times ca. 5. d. Pappus scale, \times ca. 11. e. Style branches, \times ca. 11.

aristata and occasional individuals of var. *schaffneri* to be more or less puncticulate, although the latter taxon commonly has a better defined punctate condition.

Although the aristate costa is the most distinguishing character of var. *aristata*, other morphological features serve to differentiate between the two varieties. Var. *aristata* usually has a conspicuously longer disc-floret tube, is generally a more robust plant with larger heads, having longer achenes with a variable pubescence and longer pappus scales (excluding the excurrent midribs). Var. *schaffneri* is apparently restricted to sandy loams of calcareous and igneous derivation, while var. *aristata* has been reported only from gypsiferous and alkaline soils. It should be noted, though, that I. M. Johnston (1941) does not list var. *aristata* as a

gypsiferous plant. Whereas future work may indicate a reversal of opinion, I do not believe the maintenance of two species, at least as judged by morphological data, to be warranted at this time, although the taxa should be formally recognized as distinct.

An additional problem is posed by the occurrence of two chromosome numbers in var. *schaffneri*. The $n = 8$ counts were obtained from populations more or less grouped about San Luis Potosí, whereas the single $n = 10$ count was found in a population near Aguascalientes. No significant morphological differences could be detected between the specimens from these two regions.

REPRESENTATIVE COLLECTIONS: MEXICO. AGUASCALIENTES: 7 miles N. of Rincon de Romos, 6500 ft., Oct. 6, 1955, *M. C. Johnston 2911 (TEX)*. 15 miles N. of Rincon de Romos, 2 miles from Zacatecas line, 6900 ft., Oct. 2, 1955, *M. C. Johnston 2845 (TEX)*. Near Aguascalientes, Oct. 9, 1903, *J. N. Rose & J. H. Painter 7774 (US)*. GUANAJUATO: 54 miles S. of San Luis Potosí on Hwy. 57, 6800 ft., Aug. 26, 1960, *W. L. Ellison & A. Garcia 71 (TEX)*. 9 miles N. of Queretaro state line on road from Queretaro to San Luis Potosí, 6000 ft., Sept. 20, 1959, *M. C. Johnston 4029A (TEX)*. SAN LUIS POTOSÍ: 11 miles E. of San Luis Potosí on Hwy. 86, 6300 ft., Aug. 26, 1960, *W. L. Ellison & A. Garcia 65 (TEX)*. 12 miles E. of San Luis Potosí on Hwy. 86, 6300 ft., Aug. 26, 1960, *W. L. Ellison & A. Garcia 68 (TEX)*. San Luis Potosí, 5950 ft., Aug. 23, 1926, *G. L. Fisher 134 (US)*. San Luis Potosí, 13 miles from Benito Juarez monument on road to Rio Verde, 6000 ft., Oct. 23, 1959, *J. Graham & M. C. Johnston 4469 (TEX)*. 13 miles from San Luis Potosí on road to Rio Verde, 6000 ft., Sept. 20, 1959, *M. C. Johnston 4037A (TEX)*. Charcas, July-Aug., 1934, *C. L. Lundell 5556 (ARIZ, MICH, UC, US)*. Near San Luis Potosí, 6000-8000 ft., 1878, *C. C. Parry & E. Palmer 494 (F, US)*. Near San Luis Potosí, Sept. 7, 1890, *C. G. Pringle 3266 (F, GH, MICH, UC, US)*. Km. 15 on Hwy. from San Luis Potosí to Tampico, 1750 m., w/o date, *Rzedowski 3277 (US)*. Penasco Station, 1850 m., w/o date *Rzedowski 3432 (F, TEX, US)*. 1877, *J. G. Schaffner 327, (F, GH)*. 1879, *J. G. Schaffner 753 (MICH, US)*. ZACATECAS: 9 miles S. E. of Zacatecas on Hwy. 45, 7900 ft., Oct. 2, 1955, *M. C. Johnston 2840A (TEX)*. 2 miles N. of Ojocaliente, 6800 ft., Oct. 6, 1955, *M. C. Johnston 2922 (TEX)*.

8b. *Bahia schaffneri* S. Wats. var. *aristata*
(Rydb.), comb. nov.

Bahia aristata Rydb., N. Am. Fl. 34:36. 1914. Holotype examined (GH): "Alkaline plains." Hacienda of Angostura, San Luis Potosí, Mexico, July 11, 1891, *C. G. Pringle 5127*.

Plants annual, 5-30 cm. tall. Stems decumbent, spreading from a slender taproot, 2-3 mm. in diameter, each terminal branch culminating in 1-5 monocephalic peduncles 1-7 cm. long, variously pubescent or nearly glabrous. Leaves opposite becoming alternate on the upper branches, ternately 1-4 times divided into linear segments about 1 mm. wide, 1-3 cm. long, pubescent, non- or slightly punctate with few globules of exudate. Mature heads (including florets) 6-10 mm. high, 12-18 mm. in diameter. Involucre broadly campanulate; involucral bracts pubescent with globules of exudate few or absent, 14-18 in 2 series, reflexing with age, margins membranous and occasionally purple, 3-6 mm. long, 1-2.5 mm. wide, lanceolate or oblanceolate with the apex obtuse or acute and midrib weakly developed or absent. Receptacle flat, alveolate, about 1.5 mm. in diameter. Ray florets 4-8, yellow pistillate, fertile; ligule 3-3.5 mm. long, 1.5-1.8 mm. wide, oblong-ovate with a notched or undulate apex; tube 0.2 mm. in diameter, 1.5-1.8 mm. long with few to numerous short stipitate glands. Disc florets 50-85, perfect and fertile, yellow, 3-3.6 mm. long; tube stipitate glandular, 0.2 mm. in diameter, (1.2-)1.6-1.8 mm. long; throat funnel-form-campanulate, 0.7-1.3(-2) mm. long; lobes 5, reflexed at maturity, 0.6-0.8(-1.3) mm. long, farinose on the inner surfaces; anthers 1-1.3 mm. long, partially exserted at maturity; style branches flattened, 0.5-0.7 mm. long with prominent stigmatic lines along the upper margins, reflexed at maturity, apices obtuse with papillose enlargements; achenes 2.5-4.8 mm. long, narrowly obpyramidal, 4-sided, brown to black, markedly hispid on the angles of the lower quarter, the hairs up to 0.4 mm. long, glabrate or merely hispidulous on the upper portion; pappus of 8 scarious obovate scales; scales with a prominent midrib extending as an excurrent awn, 1.2-2 mm. long without the awn, 2-3.5 mm. long with awn, 0.6-1 mm. wide. Chromosome number not determined.

DISTRIBUTION: Apparently rare, occurring on gypsiferous and alkaline soils of San Luis Potosí, 6000-6500 ft. (Fig. 54). Principal flowering dates July-September.

SPECIMENS EXAMINED: MEXICO. SAN LUIS POTOSÍ: Just S. of Cedral on road from Matehuala N. to San Miguel, on state boundary, Sept. 11-12, 1938, I. M. Johnston 7595 (GH, US). Between San Tiburcio and Angostura, July, 1911, C. A. Purpus 5161 (F, GH, UC, US).

9. *Bahia oppositifolia* (Nutt.) DC.

Trichophyllum oppositifolium Nutt., Gen. N. Am. Pl. 2:167. 1818. A possible type was examined (PH): "Upper Louisiana," w/o date, Nuttall s.n. This location refers to the Louisiana Purchase Territory, which accords with the known distribution of the species. *Helenium oppositifolium* (Nutt.) Spreng., Syst. Veg. 3:573. 1826. *Bahia oppositifolia* (Nutt.) DC., Prodr. 5:656. 1836. *Eriophyllum oppositifolium* (Nutt.) Heynh., Nom. Bot. Hort. 310. 1840. *Eriophyllum oppositifolium*

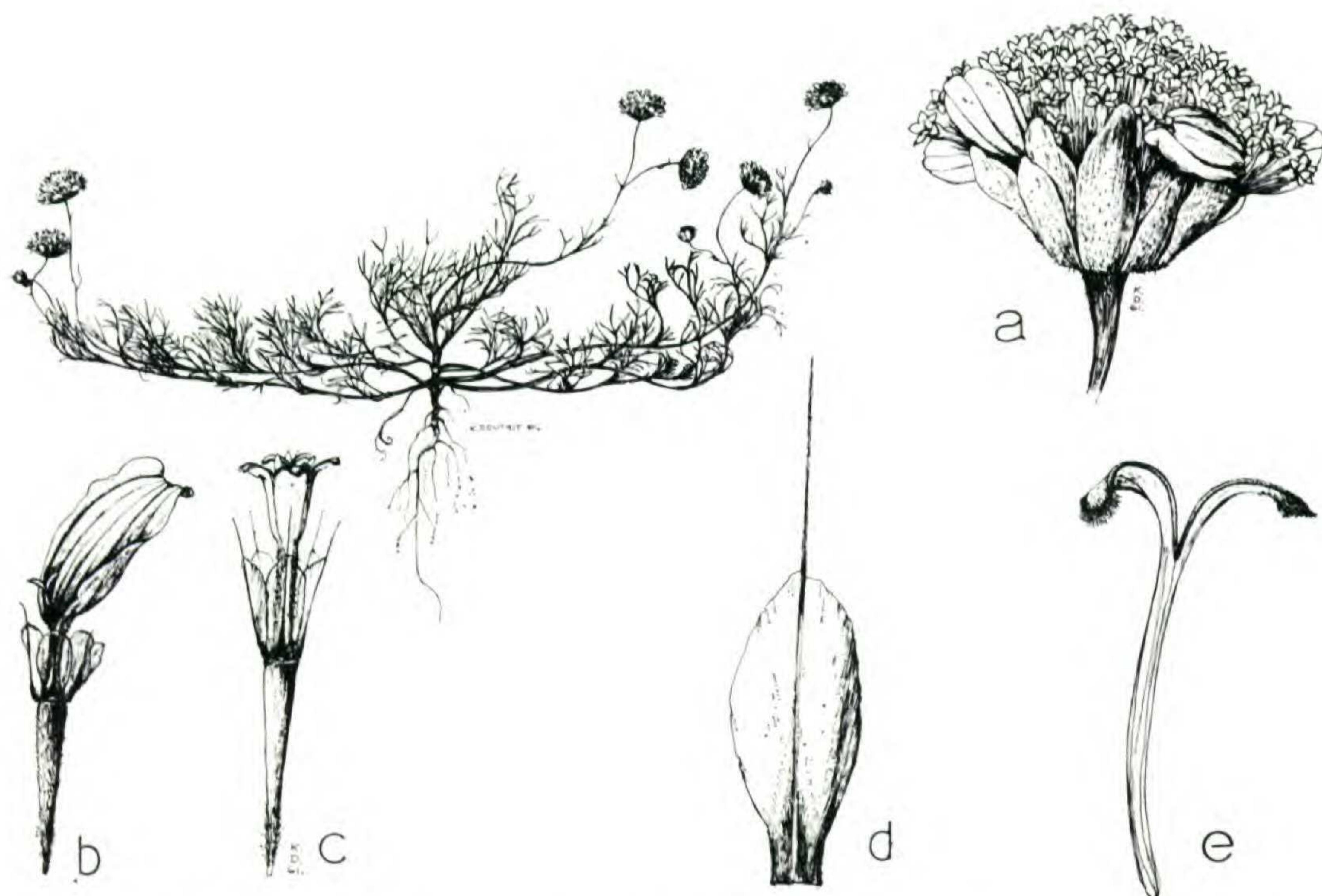


Fig. 56. *B. schaffneri* var. *aristata* (Johnston 7595, US). Entire plant, $\times \frac{2}{7}$. a. Head, \times ca. 3. b. Ray floret, \times ca. 4. c. Disc floret, \times ca. 4. d. Pappus scale, \times ca. 9. e. Style branches, \times ca. 12.

(Nutt.) Kuntze, Rev. Gen. Pl. 1:337. 1891. *Picradeniopsis oppositifolia* (Nutt.) Rydb., in Britton Man. 1008. 1901.

Plants perennial, 5-20 cm. tall. Stems herbaceous or somewhat suffrutescent, 1-numerous and erect, arising adventitiously from lateral roots, 1-3 mm. in diameter, oppositely branched, ultimate branches terminating in 1-6 monocephalic peduncles, cinereous, pubescent and farinose with few globules of exudate; peduncles 0.5-2 cm. long. Leaves opposite, ternately divided into linear segments 1-3 mm. wide, the segments entire or again divided (occasionally simple and entire at the base of the stem), 1.5-4.5(-5) cm. long, cinereous, pubescent, impressed punctate with globules of exudate in the depressions. Mature heads (including florets) 6-8 mm. high, 8-16 mm. in diameter. Involucre campanulate; involucral bracts variously pubescent with few to numerous globules of exudate, 7-9 in 1-2 series, partially reflexing with age, margins membranous, 4-8 mm. long, 1-4 mm. wide, oblong or ovate (rarely obovate) with the apex obtuse, more or less keeled with the midrib prominent. Receptacle somewhat convex, naked, 1.5-2 mm. in diameter. Ray florets 4-7, yellow, pistillate, fertile; ligule 2.5-3.5(-6) mm. long, 1.8-2.5 mm. wide, oblong or oval, the apex undulate; tube about 0.5 mm. in diameter, 1.3-1.6 mm. long with numerous short stipitate glands. Disc florets 30-40, perfect and fertile, yellow, regular, 3-5 mm. long; tube stipitate glandular about 0.5 mm. in diameter, 1-2 mm.

long; throat campanulate, 1.5-2 mm. long; lobes 5, reflexed at maturity, 0.7-1 mm. long; anthers 1.5-1.8 mm. long, partially exserted at maturity; style branches flattened, 0.8-1.2 mm. long with prominent stigmatic lines along the upper margins, reflexed at maturity, apices obtuse with papillose enlargements; achenes 3-5 mm. long, narrowly obpyramidal, 4-sided, brown to black, glandular-puberulent; pappus of 8-9 scarious oblong or oval scales; scales with an obtuse apex (rarely lanceolate with percurrent or excurrent midrib), 0.8-1.2(-2) mm. long, (0.2-) 0.5-0.8 mm. wide, thickened at the base, the midrib extending about $\frac{3}{4}$ the length of the scale.

DISTRIBUTION: Clayey flats, gravelly hillsides and sandy loam soils on the prairies of Montana, Wyoming, western North and South Dakota and Nebraska, Colorado and New Mexico (two specimens, one from Arizona and the other from Kansas, are considerably removed from the main distributional areas), 3000-7500 ft., (Fig. 52). Principal flowering dates, June-September.

B. oppositifolia and *B. woodhousei* have been distinguished from one another in the past by only two characters; namely, superficial processes on the achenes, and shape of pappus scales. Glandular-puberulent and hispidulous achenes were found to be consistent characters of *B. oppositifolia* and *B. woodhousei* respectively. Whereas lanceolate pappus scales were found in all specimens of *B. woodhousei*, exceptions to the obovate or ovate scales described for *B. oppositifolia* were encountered. Ten specimens with lanceolate pappus scales were found in this latter taxon: Colorado: *Eastwood s.n.*, *Knowlton 77*, *Palmer s.n.* Montana: *Anderson s.n.*, *Kelsey s.n.*, *Williams 56*. New Mexico: *Cockerell s.n.*, *Goddard 884*. Wyoming: *Johnson s.n.*, *Kelsey s.n.* No geographic pattern or other observable character(s) was found to be associated with this shape of pappus scale; the lanceolate scales may therefore be considered to represent an anomalous condition due to a widespread but infrequently encountered gene or gene-combination in *B. oppositifolia*.

The two species are sympatric in Colorado and New Mexico (and Arizona?). No intergrades from this area were encountered, but it should be noted that intergrades between two taxa as strikingly similar as are these would be difficult to determine except through intensive population

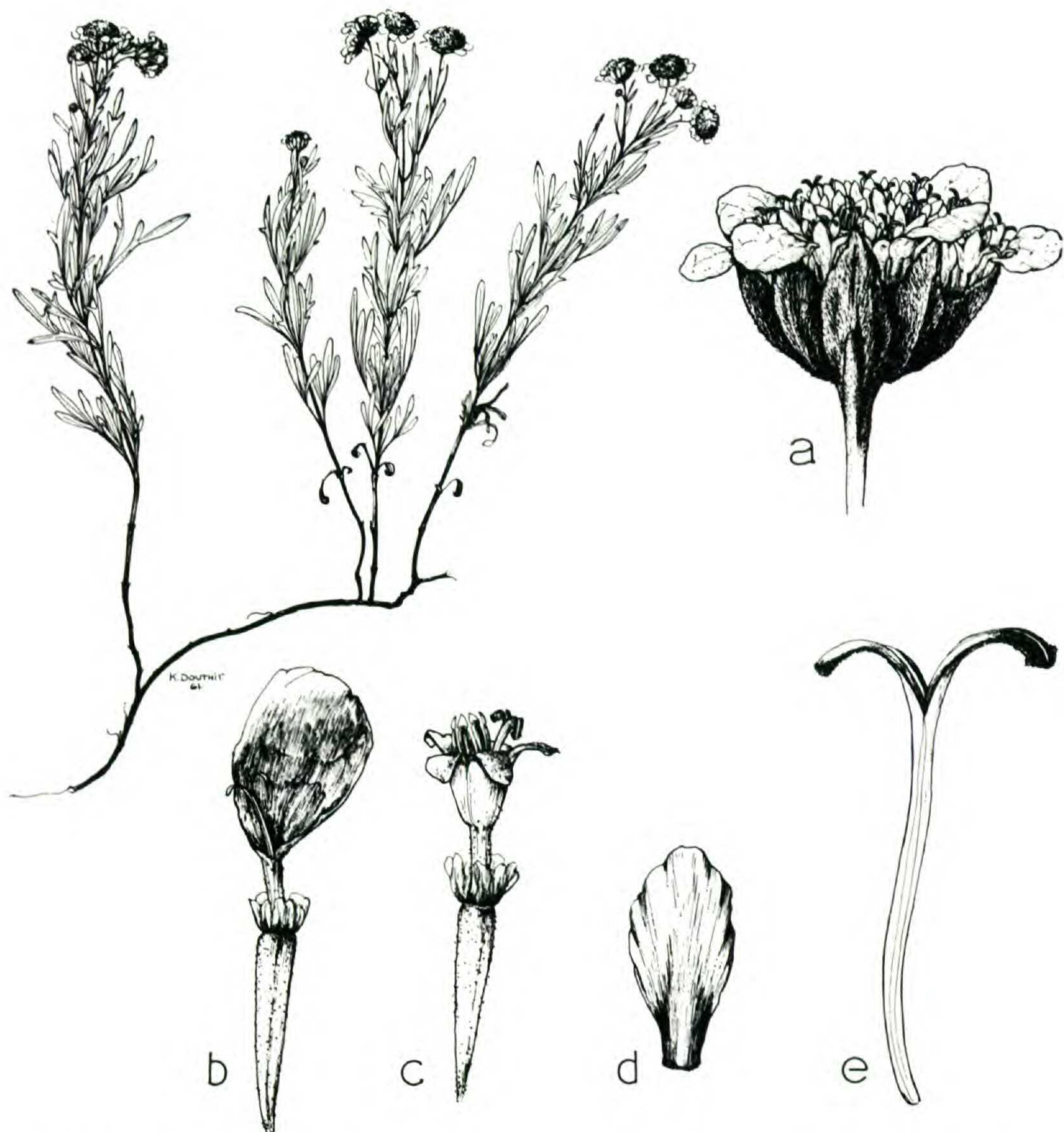


Fig. 57. *B. oppositifolia* (Sheldon 16, US). Entire plant part, \times 2/7.
 a. Head, \times ca. 2. b. Ray floret, \times ca. 4. c. Disc floret, \times ca. 4.
 d. Pappus scale, \times ca. 18. e. Style branches, \times ca. 18.

analyses. Indeed, one may wonder whether or not we are dealing with a single widespread species having a few genes controlling but one or two readily observable morphological characters. However, in addition to the key characters used by previous workers to distinguish these taxa, I have noted that *B. oppositifolia* is often more pubescent, has larger ligules and has wider corolla tubes than *B. woodhousei*.

Until further investigation including intensive field study

provides positive data for altering their taxonomic status, I believe it best to take a conservative stand and recognize the two species.

REPRESENTATIVE COLLECTIONS: ARIZONA. COCONINO CO: Flagstaff, 6900 ft., July 23, 1947, *C. F. Deaver 2304* (CAS). COLORADO. ARAPAHOE CO.: Ft. Logan, 5600 ft., July, 1934, *Cletus 269* (F). BOULDER CO.: Near South Boulder, 6000 ft. Aug. 14, 1878, *M. E. Jones 609* (F). DENVER CO.: Denver, 1616 m., Sept. 9, 1920, *R. Duthie & I. W. Clokey 3950* (CAS, DS, MICH, UC, US). Denver, Sept. 14, 1916, *A. Eastwood s.n.* (CAS). EL PASO CO.: Colorado Springs, July 2, 1926, *H. C. Benke 4305* (US). FREMONT CO.: Canon City, June, 1877, *T. S. Brandegee s.n.* (F). HUERFANO CO.: La Veta, July 13, 1896, *C. L. Shear 3567* (US). JEFFERSON CO.: 2 miles W. of Broomfield, June 27, 1954, *W. A. Weber 8737* (ARIZ, CAS, DS, TEX, UC). KIT CARSON CO.: Hugo, Aug. 17, 1875, *H. N. Patterson s.n.* (F). LARIMER CO.: Fort Collins, 5500 ft., July 8, 1884, *C. S. Sheldon 16* (DS, F, US). LAS ANIMAS CO.: 5 miles W. of Garcia, June 25, 1935, *L. Williams 2280* (UC, US). PUEBLO CO.: Pueblo, Aug., 1913, *L. H. Pammel s.n.* (TEX). WELD CO.: New Windsor, July 2, 1901, *G. E. Osterhout 2373* (UC). Mt. Golden, South Table, June 17, 1896, *F. H. Knowlton 77* (US). Colorado Territory, w/o date, *E. Palmer s.n.* (US). KANSAS. SEDGWICK CO.: Wichita, 1890, *M. A. Carleton s.n.* (F). MONTANA. Aug., 1888, *F. W. Anderson s.n.* (US). BIG HORN CO.: Fort Custer, July 24, 1889, *E. A. Mearns 174* (US). CASCADE CO.: Great Falls, July 28, 1906, *J. W. Blankenship 776* (F, UC, US). Great Falls, July 7, 1888, *R. S. Williams 56* (US). LEWIS & CLARK CO.: 1 mile N. of Wolf Creek, July 2, 1948, *C. L. Hitchcock 17952* (UC). Helena, w/o date, *F. D. Kelsey s.n.* (UC). SWEET GRASS CO.: Wreck Creek, Greycliff, 1230 m., June 16, 1912, *W. W. Eggleston 8000* (US). NEBRASKA. DAWES CO.: Whitney, July 13, 1893, *B. W. Everman s.n.* (F). NEW MEXICO. BERNALILLO CO.: Albuquerque, Aug. 19, 1883, *H. H. Rusby s.n.* (F, UC). COLFAX CO.: 0.5 miles N. of Santa Fe Forks on road to Raton, 5500 ft., July 6, 1927, *D. R. Goodard 884* (MICH, UC). Vicinity of Ute Park, 2200-2900 m., Sept. 9, 1916, *P. C. Standley 14591* (DS, US). LINCOLN CO.: Gray, 6000-6500 ft., Sept. 2, 1900, *F. S. & E. S. Earle 405* (US). MORA CO.: Wagon Mound, Aug. 26, 1886, *C. G. Pringle s.n.* (F). RIO ARRIBA CO.: Opposite San Juan, 5675 ft., June 24, 1897, *A. A. & G. Heller 3755* (DS, US). SANDOVAL CO.: Bernalillo, 1555 m., Aug. 22, 1953, *Arsene 21841* (UC). SAN MIGUEL CO.: Near Las Vegas, 1899, *T. D. A. Cockerell s.n.* (US). SANTA FE CO.: Vicinity of Santa Fe, Pankey's ranch 2000 m., Nov. 7, 1926, *G. Arsene & A. Benedict 15930* (F). Vicinity of Santa Fe, 2225 m., July 6, 1911, *P. C. Standley 6473* (US). UNION CO.: Near Okla. line, N. W. of Kenton, Okla., June 11, 1948, *C. M. Rogers 5969* (TEX, US). NORTH DAKOTA. BOWMAN CO.: Bowman, June 28, 1918, *O. A. Stevens s.n.* (CAS). GOLDEN VALLEY CO.: Sentinel Butte, July 3, 1934, *H. C. Hanson s.n.* (UC, US). SOUTH

DAKOTA. FALL RIVER CO.: Cottonwood Creek, July 29, 1911, S. S. Visher 2578 (F). HARDING CO.: Cane Hills, Aug. 2, 1910, S. S. Visher 341 (F). SHANNON CO.: Cannon, July 31, 1924, W. H. Over 16245 (US). WYOMING. YELLOWSTONE PARK, July, 1890, F. D. Kelsey s.n. (DS). Dallas, Aug. 17-18, 1905, F. W. Johnson s.n. (US). ALBANY CO.: Sybille, July 3, 1900, A. Nelson 7376 (DS, UC, US). FREMONT CO.: Bonneville, Tough Creek, June 26, 1910, A. Nelson 9428 (UC). LARAMIE CO.: 5 miles W. of Cheyenne, Sept. 16, 1934, B. Maguire & B. L. Richards, Jr. 13359 (UC). NATRONA CO.: Seventeen Mile Well on Salt Creek Road, July 9, 1901, L. N. Goodding 220 (DS, F). PLATTE CO.: Hartville, June 20, 1901, A. Nelson 8327 (DS, UC, US).

10. *Bahia woodhousei* (Gray) Gray

Achyropappus woodhousei Gray, Proc. Am. Acad. 6:546. 1866. Holotype examined (GH): New Mexico, 1865, *Woodhouse s.n.* *Schkuhria woodhousei* (Gray) Gray, Proc. Am. Acad. 9: 199. 1874. *Bahia woodhousei* (Gray) Gray, Proc. Am. Acad. 19:28. 1883. *Eriophyllum woodhousei* (Gray) Kuntze, Rev. Gen. Pl. 1:337. 1891. *Picradeniopsis woodhousei* (Gray) Rydb., Bull. Torr. Club 37:333. 1910.

Plants perennial, 5-15 cm. tall. stems herbaceous or somewhat suffrutescent, 1-numerous and erect, arising adventitiously from lateral roots, 1-3 mm. in diameter, oppositely branched, ultimate branches terminating in 1-6 monocephalic peduncles, cinereous, sparingly pubescent and farinose with few to numerous globules of exudate; peduncles 1-2 cm. long. Leaves opposite, ternately divided into linear segments 1-2 mm. wide, the latter entire or again divided, 1-3 cm. long, sparingly pubescent, cinereous, impressed punctate with globules of exudate in the depressions. Mature heads (including florets) 4-8 mm. high, 8-12 mm. in diameter. Involucre campanulate; involucral bracts puberulent and somewhat farinose with numerous globules of exudate, 8-10 in 1-2 series, partially reflexing with age, 2.5-7 mm. long, 1.5-3 mm. wide, oblong or obovate (oval) with the apex obtuse, more or less keeled with the midrib prominent, margins membranous. Receptacle flat or slightly convex, naked, about 2 mm. in diameter. Ray florets 5-9, yellow to orange, pistillate, fertile; ligule 2.2-4 mm. long, 1-1.4 mm. wide, oblong or somewhat spatulate with a notched or 2-3-lobed apex; tube about 0.3 mm. in diameter, 1-1.4 mm. long with numerous stipitate glands. Disc florets 25-40, perfect and fertile (rarely merely staminate or neutral), yellow to orange, regular (frequently zygomorphic peripherally), 2.5-5 mm. long; tube and base of throat with numerous stipitate glands; tube 0.3-0.4 mm. in diameter, 1-2 mm. long; throat campanulate, 1-2 mm. long; lobes 5, reflexed at maturity, 0.5-1 mm. long; anthers 1.5-1.8 mm. long, partially exserted at maturity; style branches flattened, 0.7-0.9 mm. long with prominent stigmatic lines along the upper margins, reflexed at maturity, apices obtuse with papillose enlargements; achenes 3-4 mm. long, narrowly obpyramidal,

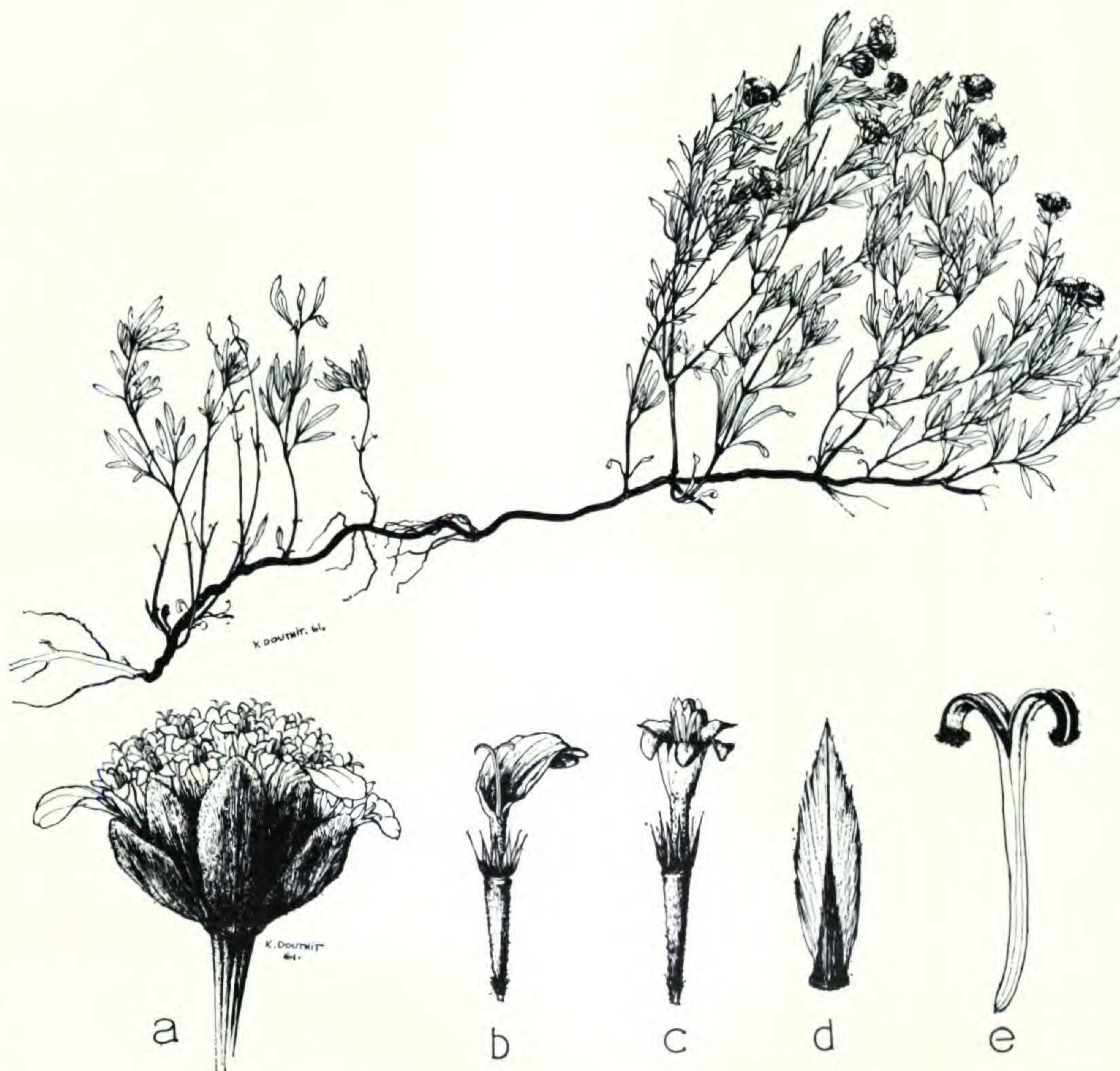


Fig. 58. *B. woodhousei* (Waterfall 9686, ARIZ.). Entire plant part, $\times 2/7$. a Head, \times ca. 2. b. Ray floret, \times ca. 3. c. Disc floret, \times ca. 3. d. Pappus scale, \times ca. 18. e. Style branches, \times ca. 18.

4-sided, brown to black, hispid on the angles of the base, otherwise hispidulous; pappus of 8-9 scarious lanceolate scales; scales 0.6-2 mm. long (subequal or conspicuously unequal on any one achene), 0.2-0.5 mm. wide, thickened at the base, midrib prominent extending to the apex (occasionally slightly excurrent).

DISTRIBUTION: Clayey or sandy soils on the prairies of eastern Colorado, western Kansas and Oklahoma, New Mexico, Arizona and northwestern Texas (also reported from extreme western Texas: Warnock, 1960), 3500-5100 ft., (Fig. 52). Principal flowering dates, May-October.

In comparing this species with *B. oppositifolia*, Rydberg indicated that "the flowers are of a much lighter color in *P.*

woodhousei [sic], the rays being ochroleucous or straw-colored." It is interesting to note, however, that "orange" flowers have been reported for *B. woodhousei* (Shinners 8134 and 8184). I saw no living specimens of *B. oppositifolia* and living plants from only one population of *B. woodhousei* (Ellison 176); the flowers of the latter were a yellowish-orange.

The populational relationships of this species to *B. oppositifolia* are discussed under the latter species.

REPRESENTATIVE COLLECTIONS: ARIZONA. NAVAJO CO.: Dagg's Reservoir, Oct. 13, 1955, C. C. Michaels 815 (CAS). COLORADO. BACA CO.: 8 miles S. W. of Pritchett on Hwy. 160, June 14, 1948, C. M. Rogers 6001 (US). ELBERT CO.: 15 miles S. W. of Limon, June 25, 1937, M. Ownbey 1304 (DS, GH, UC). WASHINGTON CO.: Akron, July 5, 1909, H. L. Shantz 966 (US). YUMA CO.: Yuma, Aug. 19, 1909, H. L. Shantz 935 (US). KANSAS. MEADE CO.: 3 miles E. & 6 miles S. of Meade, June 14, 1951, W. H. Horr & McGregor 3857 (US). NEW MEXICO. MCKINLEY CO.: Zuni, July 21, 1906, E. O. Wooton s.n. (US). QUAY CO.: Nara Visa, June 10, 1911, G. L. Fisher s.n. (UC, US). TAOS CO.: Taos, Aug. 18, 1910, E. O. Wooton s.n. (US). UNION CO.: Sierra Grande, Aug., 1903, A. H. Howell 234 (US). OKLAHOMA. BEAVER CO.: Few miles W. of Fargon, Aug. 18, 1950, G. J. Goodman & R. W. Kelting 5370 (TEX). CIMARRON CO.: 13 miles E. of Boise City, July 9, 1947, U. T. Waterfall 7416 (TEX). TEXAS CO.: 5 miles N. & 24 miles W. of Guymon, May 31, 1952, U. T. Waterfall 10801 (ARIZ, TEX). TEXAS. BAILEY CO.: 2.5 miles N. W. of Muleshoe, June 22, 1941, V. L. Cory 37521 (GH, TEX, US). DALLAS CO.: 7 miles N. W. of Dalhart, June 25, 1945, L. H. Shinners 8184 (TEX). HEMPHILL CO.: Canadian, July 11, 1934, E. L. Reed 3764 (TEX). LUBBOCK CO.: Lubbock, May 27, 1930, D. Demaree 7727 (DS, GH, US). MOORE CO.: Dumas, 3600 ft., June 10, 1945, B. & H. Jesperson 2705 (DS, UC, US). 13 miles S. of Dumas, June 24, 1945, L. H. Shinners 8135 (UC). PARMER CO.: 3 miles S. E. of Farwell on Hwy. 84, Sept. 30, 1960, W. L. Ellison 176 (TEX). RANDALL CO.: 7 miles N. of Canyon, June 22, 1945, L. H. Shinners 8047 (DS).

11. *Bahia absinthifolia* Benth.

11a. *Bahia absinthifolia* Benth. var. *absinthifolia*

Bahia absinthifolia Benth., Pl. Hartw. 18. 1839. Isotype examined (GH): Aguascalientes, Mexico, Hartweg 128. Photograph of holotype seen (MICH). *Eriophyllum absinthifolium* (Benth.) Kuntze, Rev. Gen. Pl. 1:336. 1891.

Plants perennial, suffrutescent, 10-35 em. tall. Roots with occasional elongated tuberous swellings. Stems 1-3 mm. in diameter branching

from the base, each terminal branch culminating in 1-5 monocephalic peduncles, canescent or only partially clothed with short appressed hairs; peduncles 1-8 cm. long, tomentose. Leaves opposite becoming alternate on the upper stems, highly variable in form, some being lanceolate and entire, others ternately divided into narrowly linear or lanceolate segments which may be again dissected, 10-50 mm. long with segments 1-3 mm. wide, tomentulose-canescens. Mature heads 0.5-1.5 cm. high, 1-2.3 cm. in diameter. Involucre hemispheric or broadly campanulate; involucral bracts tomentose, often farinose with occasional globules of exudate beneath the tomentum, 12-15 in 2 series with 1 or more narrowly linear outer bractlets, reflexing with age, 4-8(-10) mm. long, 1-3 mm. wide, lanceolate with apex acute, obtuse or acuminate, midrib weakly discernible from the inner surface, margins membranous. Receptacle flat or slightly convex, alveolate, 1-1.8 mm. in diameter. Ray florets 9-13, yellow, pistillate, fertile; ligule 5-9(-15) mm. long, 1.5-3 mm. wide, elliptical, the apex truncate and undulate; tube 0.2 mm. in diameter and 1.5-2 mm. long with stipitate glands. Disc florets 60-80, perfect and fertile, yellow, regular, 3-4 mm. long; tube stipitate glandular, 0.2 mm. in diameter, 1-1.7 mm. long; throat funneliform-campanulate, 1-1.8 mm. long; lobes 5, reflexing at maturity, 0.5-0.8 mm. long; anthers 1.5-1.8 mm. long, partially exserted at maturity; apices obtuse with papillose enlargements; achenes 3-5.3 mm. long, narrowly obpyramidal, 4-sided, brown to black, striate, merely hispidulous on upper portion; pappus of 6-9 scariosus obovate scales, scales 1.3-2 mm. long, 0.7-1.1 mm. wide, thickened at the base with midrib present or absent (when present, extending $\frac{1}{2}$ - $\frac{3}{4}$ the length). Chromosome numbers, $n = 12$ and 24.

DISTRIBUTION: Calcareous soils in arid regions of central and northern Mexico, 5000-7800 ft., (Fig. 59). Principal flowering dates February-October.

Whereas, *B. dealbata* was first recognized as a good species by Gray, he later altered his opinion when he stated that it "evidently passes into *B. absinthifolia*." Separation of the two taxa, *B. absinthifolia* var. *absinthifolia* and *B. absinthifolia* var. *dealbata*, was made by Gray on the basis of the latter variety's more lignescent base, more whitened foliage with a pannose tomentum, broader and less-divided leaves and broader involucral bracts. In my field study and examination of herbarium specimens I could find no feature other than that of leaf width and dissection which might be considered a key character. Moreover, no correlation was found between the leaf profile and any one or group of the other characters. Statistical comparisons such as those used by

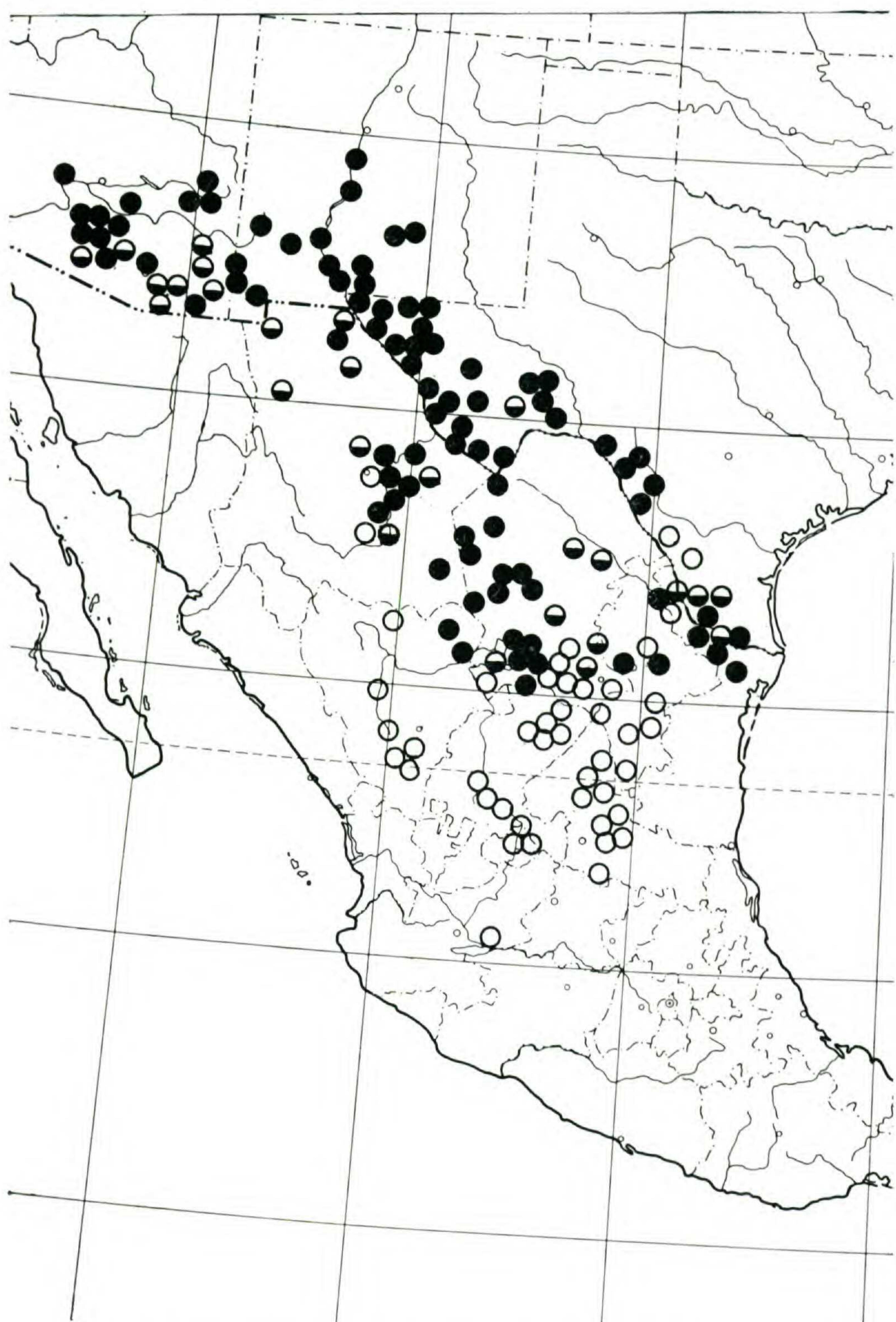


Fig. 59. Map showing distribution of *B. absinthifolia* var. *absinthifolia*, open circles; *B. a.* var. *dealbata*, closed circles; intermediate populations of the two varieties, half-closed circles.

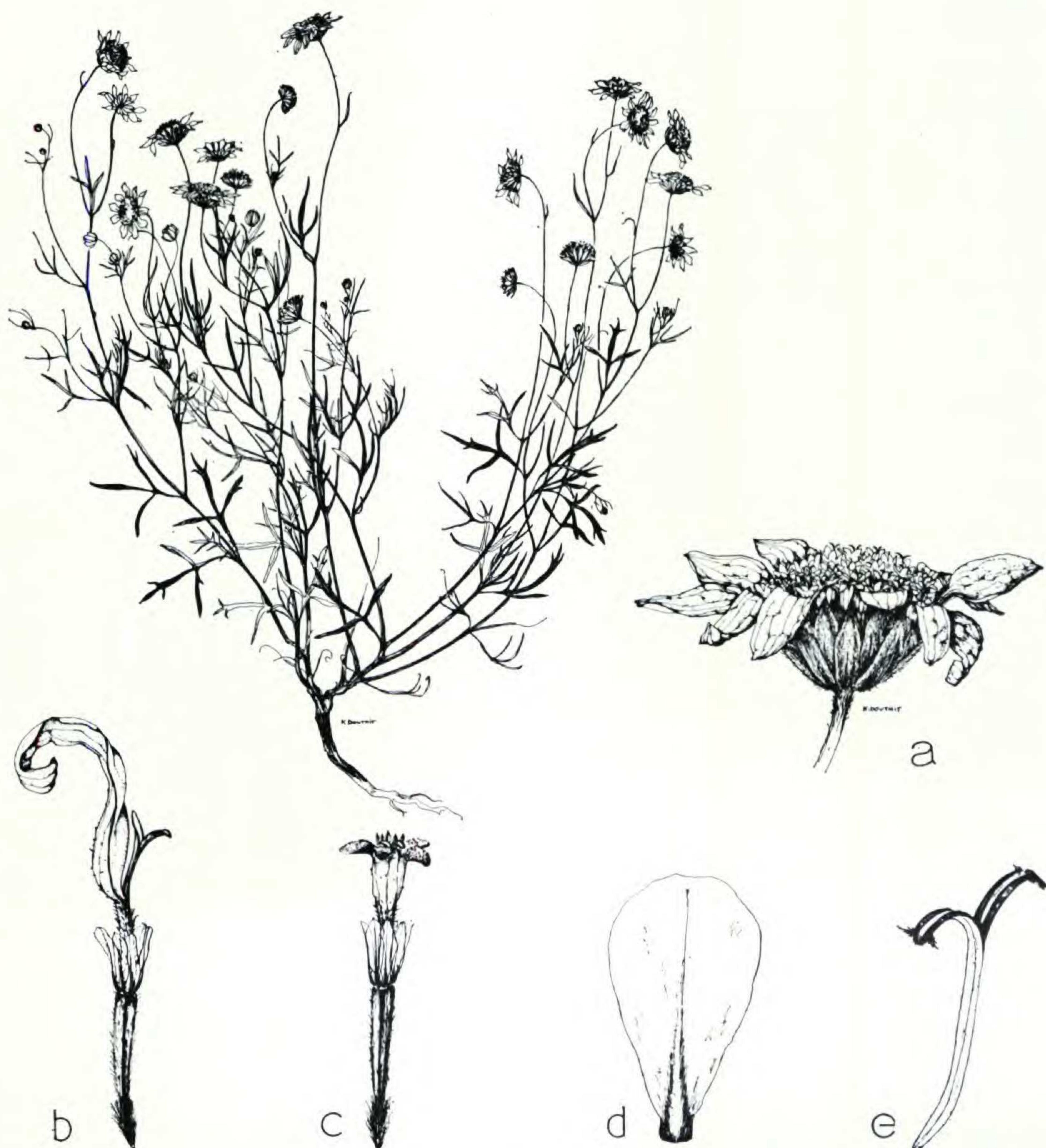


Fig. 60. *B. absinthifolia* var. *absinthifolia* (Isotype, *Bentham* 128, GH). Entire plant, \times 2/7. a. Head, \times ca. 1.5. b. Ray floret, \times ca. 3. c. Disc floret, \times ca. 3. d. Pappus scale, \times ca. 12. e. Style branches, \times ca. 12.

Anderson (1934) and others were not employed in this present study but should prove to be of real value in assessing more accurately the taxonomic status of these two varieties. Based solely on leaf character, populations of *B. absinthifolia* fall into two fairly well-defined geographical areas: the narrow-leaved var. *absinthifolia* occurring in central and

northern Mexico and the broad-leaved var. *dealbata* being found predominantly in west Texas and southern New Mexico and Arizona. Intermediate populations, generally falling in a region of overlap, were observed in the field. Numerous herbarium specimens from northern Mexico, extreme southern and southwestern Texas and southern Arizona had intermediate leaf characters. Occasional individuals within the distributional "center" of var. *dealbata* were observed to have leaves as narrowly linear as those found in var. *absinthifolia*. The reverse situation was never encountered; that is, no broad- and undissected-leaved plants were found in populations near the distributional "center" of var. *absinthifolia*.

Conservatism has led me to maintain a taxonomic *status quo* with regard to these varieties. Additional chromosome-number determinations may be useful, but the present state of knowledge offers no help. It was hoped that populational chromatographic data might elucidate the problem. Although no meaningful information for rendering a taxonomic judgment resulted from the study conducted, a more intensive biochemical study might well prove fruitful.

Although a single character cannot be considered favorable for varietal delimitation, I nevertheless believe that since the character is found only in a relatively limited area and, from transplant studies, is apparently under genetic control, the two varieties should be recognized for the present. Obviously, this opinion is subject to revision when additional information is brought to bear on the problem.

REPRESENTATIVE COLLECTIONS: TEXAS. DIMMIT CO.: E. of Carrizo Springs, May 1, 1931, M. E. Jones 28060 (CAS, DS, UC). MAVERICK CO.: Near Eagle Pass, 800 ft., April 26, 1900, C. G. Pringle 9033 (F). MEXICO. AGUASCALIENTES: 11 mi. N. of Aguascalientes, Hwy. 45, 6100 ft., Sept. 2, 1960, W. L. Ellison & A. Garcia 108 (TEX). Near Aguascalientes, Aug. 20, 1901, J. N. Rose & R. Hay 6226 (US). COAHUILA: 5 mi. S. of Saltillo, Sept. 13, 1946, F. A. Barkley 16056 (F). Road from Saltillo to Concepción del Oro, W. of Melville Station, Sept. 1-2, 1938, I. M. Johnston 7328 (GH). 10 mi. N. of Saltillo toward Piedras Negras Oct. 14, 1959, M. C. Johnston & J. Graham 4321 (TEX). Saltillo and vicinity, May, 1898, E. Palmer 117 (GH, UC, US). Parras, 111.5 mi. W. of Saltillo, June 8-28, 1880, E. Palmer 674 (GH, US).

Parras, Oct., 1910, C. A. Purpus 4649 (F, GH, UC, US). 12 mi. S. of Jimulco, 4300 ft., Sept. 14, 1939, F. Shreve 9409 (ARIZ, GH, MICH, UC). DURANGO: 116 mi. N. of Zacatecas, Hwy. 45, 6900 ft., Sept. 2, 1960, W. L. Ellison & A. Garcia 116 (TEX). 63 mi. N. of Durango, Hwy. 45, 4700 ft., Sept. 3, 1960, W. L. Ellison & A. Garcia 127 (TEX). 2 mi. N. of La Zarca, Hwy. 45, 6200 ft., Sept. 3, 1960, W. L. Ellison & A. Garcia 130 (TEX). Crest of Sierra de Zarca, 6800 ft., Sept. 18-19, 1938, I. M. Johnston 7773 (GH). Durango and vicinity, Sept., 1896, E. Palmer 617 (F, GH, UC, US). JALISCO. Lake Chapal, 1905, Mr. & Mrs. J. G. Lemmon 191 (UC). NUEVO LEÓN: 28 mi. S. of Saltillo, Hwy. 57, 6250 ft., Aug. 24, 1960, W. L. Ellison & A. Garcia 50 (TEX). 101 mi. S. of Saltillo, Hwy. 57, 5800 ft., Aug. 24, 1960, W. L. Ellison & A. Garcia 56 (TEX). 28 mi. S. of Nuevo Laredo on road to Monterrey, Apr. 18, 1938, T. C. Frye & E. M. Frye 2355 (DS). 4 mi. S. of Galeana on road to Iturbide, Oct. 8, 1959, M. C. Johnston & J. Graham 4212 (TEX). Along Pan-Am. Hwy. N. of Mamulique Pass, 1500 ft., Mr. & Mrs. W. C. Leavenworth 750 (F). Cañon de los Capulines above San Enrique, Hacienda San José de Raices, Derrumbadero, Aug. 6, 1935, C. H. Mueller 2362 (GH). Road between Doctor Arroyo and Matehuala, June 17-18, 1898, E. W. Nelson 4517 (US). Doctor Arroyo, 5700 ft., Aug. 24, 1940, F. Shreve & E. R. Tinkham 9658 (ARIZ, GH). SAN LUIS POTOSÍ: 4 mi. N. E. of San Luis Potosí, Aug. 29, 1947, F. A. Barkley, G. L. Webster & J. B. Paxson 800 (TEX). 22 mi. S. of Matehuala, Hwy. 57, 4100 ft., Aug. 25, 1960, W. L. Ellison & A. Garcia 58 (TEX). 9 mi. N. of San Luis Potosí, 6100 ft., Aug. 25, 1960, W. L. Ellison & A. Garcia 64 (TEX). 38 mi. S. of San Luis Potosí. Hwy. 57, 6000 ft., Aug. 26, 1960, W. L. Ellison & A. Garcia 70 (TEX). Road from San Luis Potosí to Matehuala (via Huizachal), 14 mi. S. of Matehuala, Sept. 10-11, 1938, I. M. Johnston 7520 (GH). At Km. 22, 11 mi. from San Luis Potosí on road to Rio Verde, 5800 ft., Sept. 20, 1959, M. C. Johnston 4038A (TEX). 10 mi. N. of Nuñez on San Luis-Matehuala Hwy., Oct. 23, 1959, M. C. Johnston & J. Graham 4465 (TEX). Charcas, July-Aug., 1934, C. L. Lundell 5359 (ARIZ, MICH, US). 22° N. lat., 6000-8000 ft., 1878, C. C. Parry & E. Palmer 493 (DS, F, GH, US). Km. 20, Hwy. between San Luis Potosí and Antiguo Morelos, 1800 m., Sept. 9, 1954, Rzedowski 4226 (F, TEX). 14 mi. S. E. of Matehuala, 4600 ft., Sept. 10, 1938, F. Shreve 8695 (ARIZ, MICH, US). TAMAULIPAS: Near Miquihuana, Aug. 8, 1941, L. R. Stanford, K. L. Rutherford & R. D. Northcraft 786 (ARIZ, DS, GH, UC). Near reservoir of Miquihuana, July 10, 1949, L. R. Stanford, L. A. Taylor & S. M. Lauber 2375 (MICH, TEX, UC, US). ZACATECAS: 1 mi. N. of Zacatecas, Hwy. 45, 7800 ft., Sept. 2, 1960, W. L. Ellison & A. Garcia 112 (TEX). 68 mi. N. of Zacatecas, Hwy. 45, 6800 ft., Sept. 2, 1960, W. L. Ellison & A. Garcia 114 (TEX). Road from Cardona S. W. to Sierra Hermosa, Sept. 3-4, 1938, I. M. Johnston 7379 (GH, US). Vicinity of Cedros, June, 1908, J. E. Kirkwood 116 (F, GH).

REPRESENTATIVE COLLECTIONS OF INTERMEDIATES:

ARIZONA. COCHISE CO.: Paradise, 5500 ft., Sept. 26, 1907, *J. C. Blumer* 2186 (F, US). Tucson, Dec. 4, 1902, *Thornber s.n.* (ARIZ, DS). TEXAS: BREWSTER CO.: 15 mi. E. of Marathon, Hwy. 90, Sept. 12, 1959, *W. L. Ellison & B. L. Turner* 41 (TEX). EL PASO CO.: El Paso, Oct. 18, 1931, *E. Whitehouse* 8446 (DS, MICH). JIM HOGG CO.: Hwy. between Gueria and Randado, Dec. 5, 1948, *Tharp, Johnson, & Webster* 48-100 (TEX). STARR CO.: Rio Grande City, 200 ft., Apr. 20, 1924, *R. Runyon* 597 (US). WEBB CO.: Vicinity of Laredo, Oct. 22, 1913, *J. N. Rose* 18042 (US). ZAPATA CO.: Near Zapata, Feb. 18, 1934, *E. U. Clover* 1796 (MICH, US). MEXICO. CHIHUAHUA: 30 mi. E. of Parral, Hwy. 45, 5100 ft., Sept. 4, 1960, *W. L. Ellison & A. Garcia* 135 (TEX). Mina Vieja near Santo Domingo, S. E. of Chihuahua, 7200 ft., Sept. 5, 1960, *W. L. Ellison & A. Garcia* 153 (TEX). Sand dunes, Oct. 10, 1935, *H. LeSueur Mex.* 450 (F, TEX). Near Casas Grandes, Aug. 30, 1899, *E. W. Nelson* 6337 (GH, US). COAHUILA: Saltillo, 1600 m., May 1909, *G. Arsene* 3471 (US). Road from Piedras Negras S. to Monclova, Aug. 22-24, 1938, *I. M. Johnston* 7082 (GH). 4 mi. N. E. of San Lázaro, 78 mi. N. of Saltillo, 2000 ft., Oct. 7, 1959, *M. C. Johnston & J. Graham* 4185 (TEX). Del Carmen Mts., Aug. 15, 1936, *E. G. Marsh, Jr.* 671 (F, GH). Saltillo, Apr. 1-15, 1880, *E. Palmer* 672 (F, GH, US). 48 mi. W. of Saltillo on road to Torreon, 3800 ft., Sept. 15, 1938, *F. Shreve* 8750 (ARIZ, GH, MICH, UC). Vicinity of Santa Elena Mines, foothills of Sierra de las Cruces, June 26, 1941, *R. M. Stewart* 634 (GH). NUEVO LEÓN: 36 mi. N. E. of Sabinas Hidalgo, March 24, 1944, *F. A. Barkley* 14574 (TEX, US). 28 mi. S. of Nuevo Laredo on road to Monterrey, Apr. 18, 1939, *T. C. Frye & E. M. Frye* 2355 (GH, UC).

11b. *Bahia absinthifolia* Benth. var. *dealbata* (Gray) Gray

Bahia dealbata Gray, Mem. Am. Acad. II. 4:99. 1849. Holotype examined (GH): "Valley between Mapimi and Guajuilla," 1847, Chihuahua, Mexico, Dr. Gregg. A paratype was likewise examined: May 8, 1847, Cadenas, Mexico, Dr. Gregg. *Bahia absinthifolia* Benth. var. *dealbata* (Gray) Gray, Pl. Wright. 1:121. 1852. *Picradeniopsis dealbata* (Gray) Woot. & Standl., Contr. U. S. Nat. Herb. 16:192. 1913.

Plants perennial, suffrutescent, 10-40 cm. tall. Roots with occasional elongated tuberous swellings. Stems 1-3 mm. in diameter branching from the base, each terminal branch culminating in 1-5 monocephalic peduncles, canescent or only partially clothed with short appressed hairs; peduncles 1-8 cm. long, tomentose. Leaves opposite becoming alternate on the upper stems, highly variable in form, some being narrowly to broadly lanceolate and entire or toothed with others ternately divided into narrow-to-broad linear segments which may themselves be divided, 10-40 (-50) mm. long, 1-15 mm. wide at the point of maximum width, tomentulose-canescens. Mature heads 0.5-1.5 cm. high, 1-2.5 cm. in diameter. Involucre hemispheric or broadly campanulate; involucral bracts tomentose and farinose with few globules

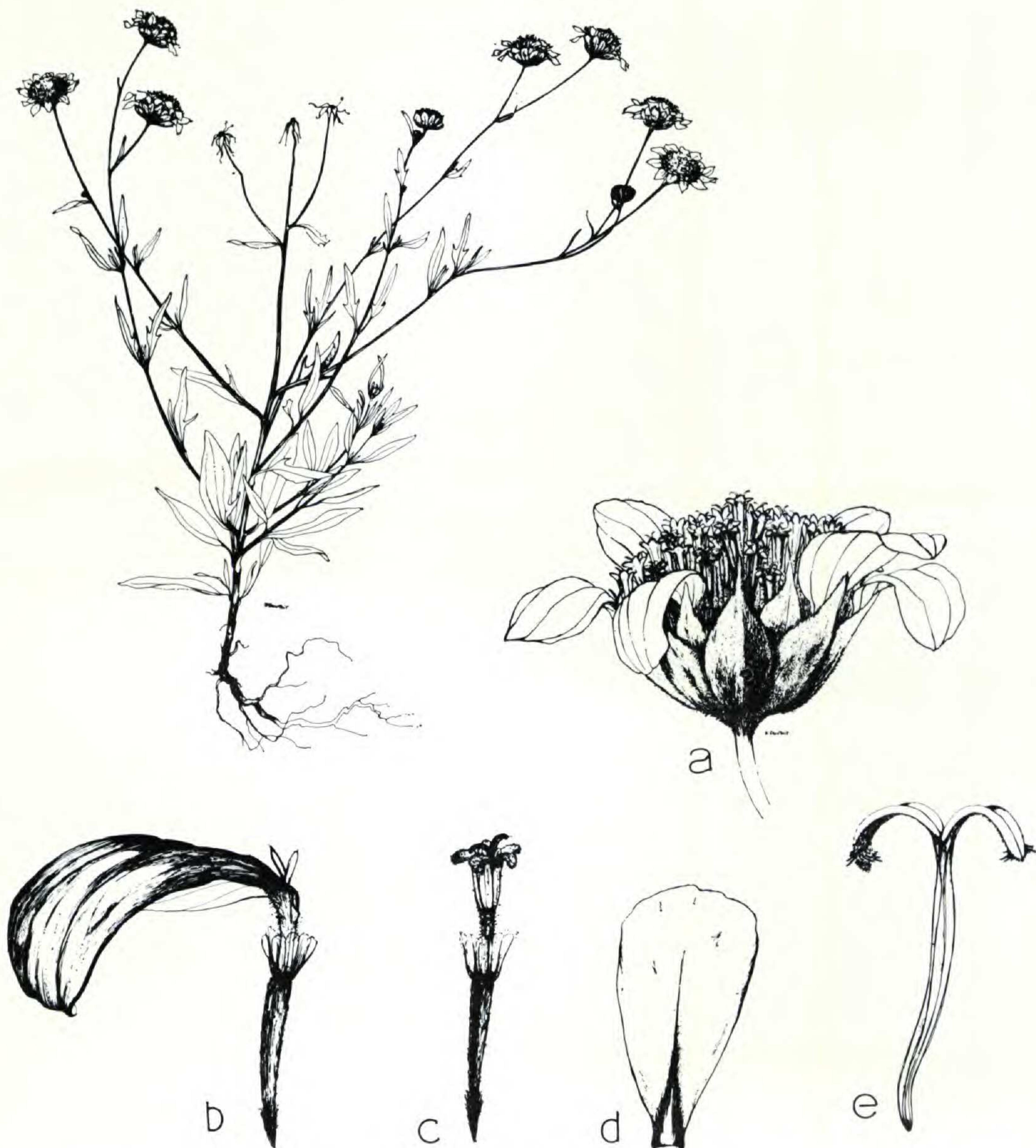


Fig. 61. *B. absinthifolia* var. *dealbata* (E. & G. 138, TEX). Entire plant, $\times 2/7$. a. Head, \times ca. 1.5. b. Ray floret, \times ca. 3. c. Disc floret, \times ca. 3. d. Pappus scale, \times ca. 12. e. Style branches, \times ca. 12.

of exudate beneath the tomentum, 12-16 in 2 series with 1 or more outer bractlets, reflexing with age, 5-9 mm. long, 1-4 mm. wide, lanceolate with apex acute to ovate or frequently acuminate, midrib weakly discernible from the inner surface, margins membranous. Receptacle flat or slightly convex, alveolate, 1.5-1.8 mm. in diameter. Ray florets 10-13, yellow, pistillate, fertile; ligule 5-12 mm. long, 2-3.5 mm. wide, oblong or elliptical, the apex undulate and truncate; tube 0.2-0.3 mm. in diameter and 1.5-2 mm. long with stipitate glands. Disc florets 55-70,

perfect and fertile, yellow, regular, 3.5-4.5 mm. long; tube stipitate glandular, 0.2-0.3 mm. in diameter, 1.2-1.5 mm. long; throat funnel-form-campanulate, 1.2-2.5 mm. long; lobes 5, reflexing at maturity, 0.3-0.8 mm. long; anthers 1.6-1.8 mm. long, partially exserted at maturity; style branches flattened, 0.7-1 mm. long with prominent stigmatic lines on the upper margins, reflexed at maturity, apices obtuse with papillose enlargements; achenes 2.5-5.5 mm. long, narrowly obpyramidal, 4-sided, brown to black, striate, hispid on lower 1/3 with hairs 0.5-0.8 mm. long, merely hispidulous on upper portion; pappus of 6-9 scarious obovate scales; scales 1.2-2 mm. long, 0.6-0.8 mm. wide, thickened at the base with midrib present or absent (when present, extending 1/2-3/4 the length). Chromosome numbers, $n = 12, 24$ and 36.

DISTRIBUTION: Calcareous soils in arid regions of northern Mexico, western Texas, southern New Mexico and southern Arizona, 1000-7000 ft., (Fig. 59). Principal flowering dates February-October.

REPRESENTATIVE COLLECTIONS: ARIZONA. COCHISE CO.: Vicinity of Douglas, May 22, 1907, L. N. Goodding 2271 (UC). GRAHAM CO.: Between Solomonville & Clifton, 4.7 mi. S. of Greenlee Co. line, 4000 ft., Oct. 7, 1942, C. B. Wolf & P. C. Everett 11,401 (ARIZ, TEX, UC). MARICOPA CO.: Near Tempe, May 4, 1926, G. J. Harrison 1793 (US). PIMA CO.: Mesas, Tucson, May 17, 1903, J. J. Thornber 392 (ARIZ, CAS, DS, UC, US). PINAL CO.: Mammoth, Aug., 1891, G. C. Nealley 274 (US). NEW MEXICO. DONA ANA CO.: Mesa W. of Organ Mts., Oct. 17, 1903, E. O. Wooton s.n. (ARIZ, MICH, UC, US). GRANT CO.: Lake Valley, 1914, I. M. Beals s.n. (US). HIDALGO CO.: Lordsburg, May 15, 1919, A. Eastwood 8586 (CAS). OTERO CO.: Alamogordo, June, 1915, B. P. Baker s.n. (US). SOCORRO CO.: Near Socorro, July, 1881, H. H. Rusby 207 (F, MICH). TEXAS. BREWSTER CO.: 48 mi. S. of Alpine, Sept. 12, 1959, W. L. Ellison & B. L. Turner 27 (TEX). 48 mi. S. of Alpine, Hwy. 118, W. L. Ellison & B. L. Turner 28 (TEX). Terlingua, Sept. 12, 1959, W. L. Ellison & B. L. Turner 34 (TEX). CULBERSON CO.: ca. 8 mi. N. of Van Horn, 4000 ft. Aug. 24, 1950, B. H. Warnock 9322 (LL). EL PASO CO.: El Paso, Apr. 17, 1884, M. E. Jones 3720 (ARIZ, CAS, DS, F, US). HUDSPETH CO.: 5 mi. W. of Van Horn, Beach Mts., 4100 ft., Sept. 7, 1955, B. H. Warnock 13624 (LL, TEX). PECOS CO.: Hwy. 290, 32 mi. E. of Ft. Stockton, Sept. 11, 1959, W. L. Ellison & B. L. Turner 15 (TEX). STARR CO.: Rio Grande City, Feb. 28, 1930, B. C. Tharp 7305 (MICH, TEX, US). TERRELL CO.: 26 mi. E. of Sander-son, Hwy. 90, Sept. 12, 1959, W. L. Ellison & B. L. Turner 42 (TEX). VAL VERDE CO.: Canyon of Pecos R., 1 mi. above mouth at crossing of Hwy. 90, March 29, 1947, R. McVaugh 7697 (DS, F, MICH, TEX). MEXICO, CHIHUAHUA: 78 mi. N. of Parral, Hwy. 45, 5100 ft., Sept. 4, 1960, W. L. Ellison & A. Garcia 138 (TEX). Samalayuca, Sept. 23, 1886, C. G. Pringle 1031 (F, US). 21 mi. S. of Ojinaga, 3000 ft., Aug. 1,

1937, *F. Shreve* 8100 (ARIZ). 3 km. N. E. mouth of Cañon del Rayo, towards N. end of Sierra del Diablo ca. lat. $27^{\circ}20'$ N., July 25, 1941, *R. M. Stewart* 852 (GH). 8 mi. W. of Guimbalete, road to Escalon, July 24, 1939, *S. S. White* 2035 (MICH). COAHUILA: 55 mi. W. of Monterrey, Hwy. 40, 3800 ft., Aug. 24, 1960, *W. L. Ellison & A. Garcia* 49 (TEX). General Cepeda, 10,500 ft., July 21, 1944, *G. B. Hinton* 16578 (GH, US). Potrero del Cuervo Chico, 3 mi. S. of Tanque La Luz, Aug. 28, 1941, *I. M. Johnston* 8576 (GH). Piachos Colorados, ca. lat. $28^{\circ}36'$, Aug. 11, 1940, *I. M. Johnston & C. H. Mueller* 124 (GH). Torreon, Nov. 21, 1925, *S. Juzepczuk* 681 (US). El Carmen, Oct. 10-19, 1935, *H. LeSueur Mex.* 351 (F, GH, TEX). Cuatro Cienegas, Aug. 23, 1939, *E. G. Marsh* 2045 (F, GH). 4 mi. S. W. of Hipolito, Aug. 29, 1939, *C. H. Mueller* 3022 (GH, LL, MICH, UC). Cerro de Cypriano, June, 1910, *C. A. Purpus* 4470 (UC). Paila, Rt. 40, Aug. 12, 1959, *H. F. L. Rock* M-483A (TEX). 1 km. N. W. of Noria de San Juan, road from Guimalite S. E. to Acatita, Oct. 14, 1942, *R. Santos* 3010 (GH). 30 km. W. of Cuatro Cienegas, Cañon de Jara, E. of Socorro, Feb. 1-5, 1941, *A. H. Schroeder* 37 (GH). Hipolito, 3300 ft., Aug. 30, 1938, *F. Shreve* 8506 (ARIZ). 9 mi. W. of Cuatro Cienegas on road to El Oro, July 21-22, 1939, *S. S. White* 1934 (ARIZ, GH, MICH). Hipolito, June 14, 1936, *F. L. Wynd & C. H. Mueller* 55 (ARIZ, GH). DURANGO: 7 mi. S. E. of Conejos, May 4, 1939, *D. S. Correll & I. M. Johnston* 21437 (LL). Durango and vicinity, Sept. 1896, *E. Palmer* 701 (GH, US). NUEVO LEÓN: Km. 216 from Matamoros, 4 mi. W. of bridge over Rio San Juan on Monterrey-Reynosa Hwy., Oct. 18, 1959, *M. C. Johnston* 4353A (TEX). 27 mi. W. of Monterrey on Saltillo Hwy., Oct. 14, 1959, *M. C. Johnston & J. Graham* 4317 (TEX). Monterrey, 1924, *C. R. Orcutt* 1291 (US).

12. *Bahia xylopoda* Greenman

Bahia xylopoda Greenman, Proc. Am. Acad. 34:577. 1899. Holotype examined (GH): "Bare hills above Pachuca, 8500 ft.", July 30, 1898, Hidalgo, Mexico, *C. G. Pringle* 6931. Isotypes examined (F, UC, US).

B. ehrenbergii Schultz-Bip. ex Rydb., N. A. Fl. 34:35. 1914, isotype examined (GH): Mexico, *O. Ehrenberg* 362.

Plants perennial, suffrutescent, 10-30 cm. tall. Rootstocks 2-5 (-15) mm. in diameter near the crown; roots ramifying horizontally and producing adventitious shoots, the smaller rootlets having occasional elongated tuberous swellings. Stems erect or somewhat decumbent, 1-3 (-7) mm. in diameter, branching from the base with each terminal branch culminating in 1-6 monocephalic peduncles, occasionally farnose at the base, variously pubescent and usually becoming increasingly glandular in the upper stems; peduncles 1-7 (-12) cm. long, more or less pubescent or with numerous stipitate glands and few to many globules of exudate adnate to the surface. Leaves opposite becoming alternate in the upper stems, ternately divided into trifid, pinnatifid or bipinnatifid linear segments generally about 1 mm. wide, 1-4 cm.

long, pubescent, impressed punctate with globules of exudate in the depressions. Mature heads (including florets) about 10 mm. high, 15-20 mm. in diameter. Involucre broadly turbinate-campanulate; involucral bracts variously pubescent, occasionally farinose, frequently with stipitate glands (these occasionally being purple) and small globules of exudate, 11-18 in 2(-3) series, reflexing with age, margins membranous, occasionally tinged with purple or red (rarely completely colored), 3.5-7 mm. long, 1-2 mm. wide, lanceolate or obovate with the apex obtuse and the midrib weakly discernible or absent. Receptacle flat or slightly convex, alveolate, 1-2 mm. in diameter. Ray florets 9-15, yellow, pistillate, fertile; ligule 4-8 mm. long, 2-4 mm. wide, oval or oblong with truncate irregularly lobed apex; tube 0.2-0.5 mm. in diameter, 1.5-2.5 mm. long with numerous stipitate glands. Disc florets 60-120, perfect and fertile, yellow, regular (rarely slightly zygomorphic peripherally), 3-5 mm. long; tube stipitate glandular, 0.25 mm. in diameter, 1.2-2 mm. long; throat funneliform, 1-2 mm. long; lobes 5, reflexed at maturity, 0.5-1 mm. long; anthers 1.5-1.8 mm. long, partially exserted at maturity; style branches flattened, 0.7-1.2 mm. long with prominent stigmatic lines along the upper margins, reflexed at maturity, apices more or less obtuse with papillose enlargements; achenes 3.2-5.5 mm. long, narrowly obpyramidal, 4-sided, brown to black, hispid on the angles of the lower quarter with hairs to 0.8 mm. long, hispidulous on the sides and angles of the upper portion (occasionally almost glabrous), the hairs generally about 0.2 mm. long; pappus of 8 scarious obovate (occasionally spatulate) scales; scales 1.3-3 mm. long, 0.5-1.2 mm. wide, thickened at the base with a definite costa extending about 2/3 the length of the scales (occasionally little or no costa, rarely with prominent excurrent midribs). Chromosome number, $n = 11$.

DISTRIBUTION: Sandy or clay loam of volcanic origin or rocky calcareous mesas and slopes in disturbed habitats of southern Hidalgo, 7000-8500 ft., (Fig. 54). Principal flowering dates June-November.

Greenman, in his original description of *B. xylopoda*, states that "this species is nearly related to *B. pringlei* Greenm., but is distinguished readily by the longer achenes, narrower scales of the pappus, and also, according to Mr. Pringle, by the entire absence of running roots." With reference to this quotation, attention should be called to the characteristics for "distinguishing readily" between the taxa. Achenal length is so variable in the two species that it cannot be used to characterize either taxon except perhaps in a statistical way, although there is a tendency for longer

achenes in *B. xylopoda*. A close examination of the root systems of the two species, both in the field and from herbarium specimens, indicated that *B. pringlei* and *B. xylopoda* both have "running roots." Morphologically, I found but one consistent feature which provides a ready key character for separation of the species; namely, the width-to-length ratio of the pappus scales. Expressed on a percentage basis, i.e., width/length \times 100, *B. pringlei* has values ranging from 75 to 120, whereas this ratio in *B. xylopoda* varies from 40 to 70.

There are other overlapping character combinations such as degree of root thickness, width or leaf, degree of glandulosity and/or farinose condition, which, when coupled with the above-mentioned pappus-dimension ratio, serve to separate the two taxa on morphological grounds. Anderson and Whitaker (1934) in their discussion of speciation in *Uvularia* state that "the acknowledged discontinuity between . . . two species, taken in their entirety, is a discontinuity of combinations, reinforced by a few discontinuous differences in single characters." This is somewhat apropos to the two taxa under consideration here; i.e., the slight overlapping differences between these two species are perhaps more characteristic than the discontinuous ones, though it is on the discontinuous ones that we commonly rely for ready identification.

In addition to the exomorphic features mentioned above, the two taxa, so far as known, have different chromosome numbers; *B. xylopoda* is diploid with $n = 11$ while *B. pringlei* is tetraploid with $n = 22$.

In my field study of these taxa, four populations of *B. pringlei* were examined whereas only a single population of *B. xylopoda* was seen. Until further field work is conducted, and additional cytological, biochemical and morphological study is done, I believe a conservative approach to be indicated; that is, *B. xylopoda* and *B. pringlei* should be treated as separate species.

Emphasis should be given to the facts that both of the species are known only from the state of Hidalgo, and that

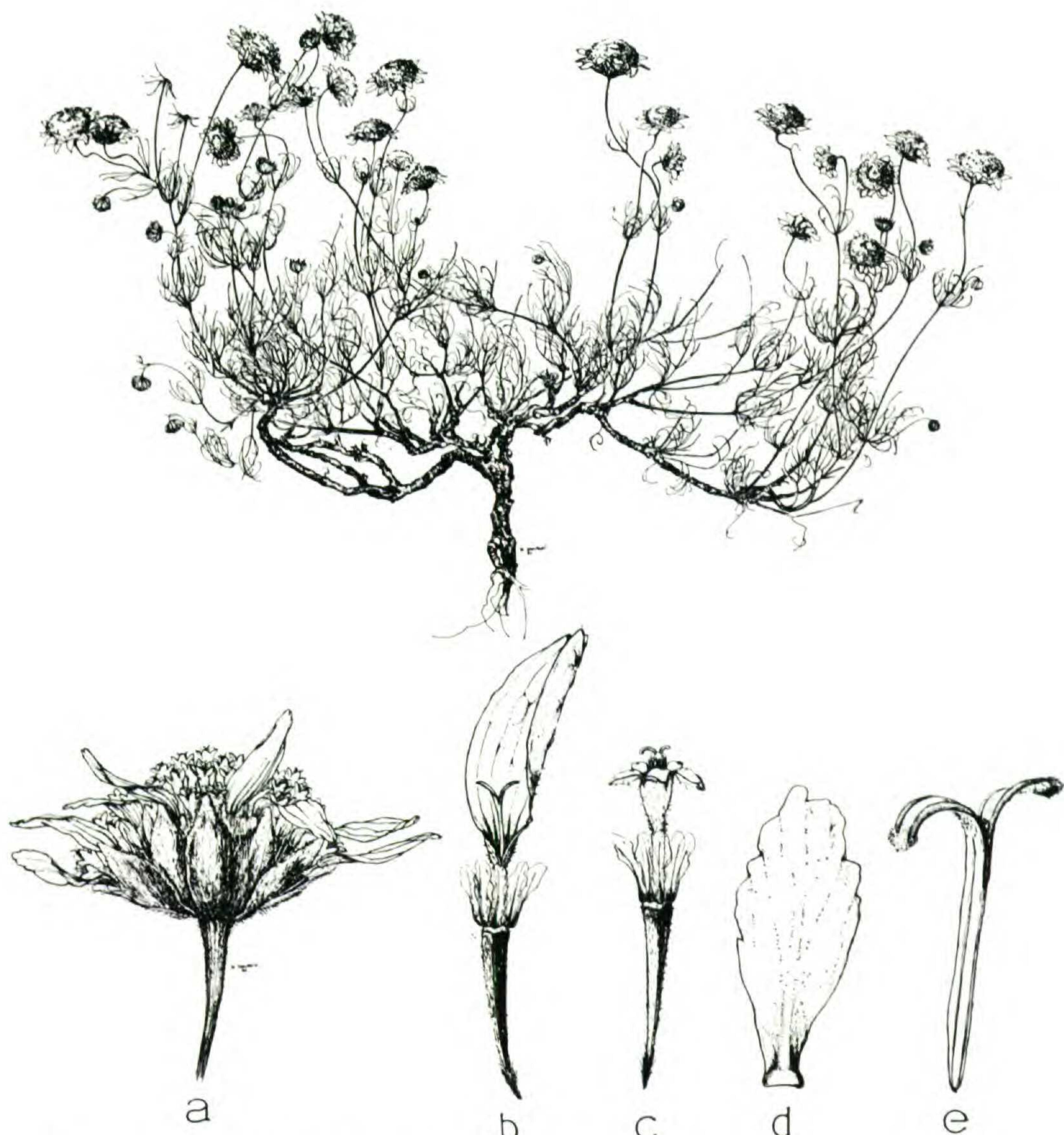


Fig. 62. *B. xylopoda* (Holotype, Pringle 6931, GH). Entire plant, $\times 2/7$. a. Head, \times ca. 1.5. b. Ray floret, \times ca. 3. c. Disc floret, \times ca. 3. d. Pappus scale, \times ca. 12. e. Style branches, \times ca. 12.

they are partially sympatric. No evidence of intergradation was seen by me; however, as previously indicated, inadequate field study was conducted with respect to this problem.

Attention should be called to two individuals with prominent excurrent midribs which were discovered in a population of otherwise typical *B. xylopoda* (Ellison 89). It is probable that this character is the result of the segregation of only a few genes; if so, it should be expected in other pop-

ulations. However, this character was not found in the several populational analyses which I made of *B. pringlei*.

B. ehrenbergii is known only from the type specimen; "Mexico" is given as the locality. Careful examination indicates that it is clearly *B. xylopoda*. A single feature that is distinguishing is the lack of the characteristic globules of resinous exudate within the depressions of the punctate leaves. There being no other correlative differences, I do not consider this condition sufficient for the delimitation of a species.

SPECIMENS EXAMINED: MEXICO. MEXICO: Morelia, June 9, 1910 (locality evidently in error), Arsene s.n. (F). HIDALGO: Just outside Pachuca on Hwy. 105, 7700 ft., Aug. 29, 1960, W. L. Ellison & A. Garcia 89 (TEX). Pachuca, 8200 ft., July 19, 1935, G. L. Fisher 35246 (ARIZ, F, GH, US). Sept., 1839, J. Gay 1870 (GH). 7 miles N. of Apam on road to Pachuquilla, 8000 ft., Sept. 16, 1959, M. C. Johnston 4016A (TEX). 10 miles E. of Pachuca, on road to Tulancingo, Sept. 25, 1959, M. C. Johnston 4051A (TEX). 8 miles S. of Actopan toward Pachuca, 7000 ft., Nov. 17, 1959, J. Graham & M. C. Johnston 4759 (TEX). Regla, June, 1945, M. Martinez s.n. (F). El Arenal, W. of Hwy. at Km. 104 S. of Actopan, 2700 m., Oct. 12, 1947, H. E. Moore, Jr. 1499 (GH). S. E. of Epazoyucan, 2500-2700 m., June 14, 1947, H. E. Moore, Jr. 3054 (GH, UC). Pachuca, Sept. 5, 1910, C. R. Orcutt 3920 (F, GH, US). Above Pachuca, 8500 ft., Aug. 25, 1902, C. G. Pringle 9856 (F, GH, US). Near Metepec Station, 8300 ft., June 27, 1904, C. G. Pringle 13029 (ARIZ, F, GH, MICH, US). Sierra de Pachuca, July 21-22, 1901, J. N. Rose & R. Hay 5631 (F, GH, US). Sierra de Pachuca, July 20 & 24, 1905, J. N. Rose, J. H. Painter & J. S. Rose 8749 (US).

13. *Bahia pringlei* Greenman

Bahia pringlei Greenman, Proc. Am. Acad. 32: 309. 1897. Holotype examined (GH): "Calcareous bluffs, valley near Tula, 6800 ft.," August 6, 1896, Hidalgo, Mexico, C. G. Pringle 6407. Isotypes examined (CAS, F, UC, US).

Plants perennial, suffrutescent, 20-30 cm. tall. Generally slender rootstock, 2-4(-8) mm. in diameter at the base, roots ramifying horizontally and vertically, frequent elongate tuberous swellings, one to few adventitious shoots. Stems more or less decumbent (occasionally erect), 1-4 mm. in diameter branching from the base, each terminal branch culminating in 1-6 monocephalic peduncles, pubescent, usually somewhat farinose; peduncles 1-6 cm. long, pubescent, globules of exudate adnate to the surface. Leaves opposite, becoming alternate on the upper stems, ternately divided into pinnatifid or bipinnatifid linear segments about 1 mm. wide, 1.5-5 cm. long, more or less densely pubescent, puncticulate with globules of exudate in the depressions.



Fig. 63. *B. pringlei* (Holotype, Pringle 6407, GH). Entire plant, $\times 2/7$. a. Head, \times ca. 1.5. b. Ray floret, \times ca. 3. c. Disc floret, \times ca. 3. d. Pappus scale, \times ca. 12. e. Style branches, \times ca. 12.

Mature heads (including florets), 8-15 mm. high, 15-20 mm. in diameter. Involucre broadly turbinate-campanulate; involucral bracts variously pubescent and often farinose, 10-20 in 2-3 series, reflexing with age, membranous margins occasionally tinged with purple, 3-6 mm. long, 1-2.5 mm. wide, obovate or lanceolate with the apex obtuse and the midrib weakly discernible or absent. Receptacle flat, alveolate,

1-2 mm. in diameter. Ray florets 9-15, yellow, pistillate, fertile; ligule 4-6 mm. long, 2-4 mm. wide, oblong to oval with irregularly truncate notched or 3-lobed apex; tube 0.3 mm. in diameter, 1.6-2.3 mm. long with numerous stipitate glands. Disc florets 60-115, perfect and fertile, yellow, regular (rarely slightly zygomorphic peripherally), 3-6 mm. long; tube and throat with numerous stipitate glands; tube 0.3 mm. in diameter, 1-2 mm. long; throat funnelform-campanulate, 1.2-1.7 mm. long; lobes 5, reflexed at maturity, 0.6-1 mm. long; anthers 1.5-2 mm. long, partially exserted at maturity; style branches flattened, 0.7-1 mm. long with prominent stigmatic lines along the upper margins, reflexed at maturity, apices more or less obtuse with papillose enlargements; achenes 3-5 mm. long, narrowly obpyramidal, 4-sided, brown to black, hispid on the angles of the lower quarter with hairs 0.2-0.4 mm. long, hispidulous on the angles and sides of the upper part, the hairs generally being less than 0.1 mm. long; pappus of 8 scarious broadly obovate scales; scales 1.5-2 mm. long, 1-1.8 mm. wide, thickened at the base but with little or no midrib (occasionally callous-thickened for 1/2 the pappus length). Chromosome number, $n = 22$.

DISTRIBUTION: Calcareous soil or sandy loam in disturbed habitats of central and southern Hidalgo, 6500-8000 ft. (Fig. 54). Principal flowering dates July-September.

For a consideration of this species, the reader is referred to the discussion under *B. xylopoda*.

SPECIMENS EXAMINED: MEXICO. HIDALGO: 2 miles W. of Tula on Hwy. 126, 6800 ft., Aug. 27, 1960, *W. L. Ellison & A. Garcia* 78 (TEX). 10 miles S. of Actopan on Hwy. 85, 8100 ft., Aug. 28, 1960, *W. L. Ellison & A. Garcia* 83 (TEX). 2 miles E. of Pachuca on Hwy. 130, 7700 ft., Aug. 29, 1960, *W. L. Ellison & Garcia* 86 (TEX). 10 miles N. of Actopan on Hwy. 85, 7400 ft., Aug. 29, 1960, *W. L. Ellison & A. Garcia* 90 (TEX). Near Pachuca, 8000 ft., Aug. 12, 1898, *C. G. Pringle* 7575 (F). Near Tula, 6800 ft., Sept. 21, 1901, *C. G. Pringle* 9452 (GH, MICH, US). Dublan, 6800 ft., Sept. 16, 1902, *C. G. Pringle* 9854 (F, GH, MICH, US). Ixmiquilpan, July, 1903, *C. A. Purpus* 443 (UC, US).

Excluded Species

- Bahia achillaeoides* DC. Prodr. 5:657. 1836. = *Eriophyllum lanatum* var. *achillaeoides* (DC) Jepson.
- Bahia ambigua* Gray. Bot. Calif. 1:382. 1876. = *Eriophyllum ambiguum* (Gray) Gray.
- Bahia alternifolia* Less. ex O. Ktze. Rev. Gen. 1:336. 1891. = *Nomen nudum*.
- Bahia angustifolia* (Spreng.) DC. Prod. 5:656. 1836. = *Calea angustifolia* (Spreng.) Sch.-Bip. ex Baker.
- Bahia anthemoides* (H. B. K.) Gray. Proc. Am. Acad. 15:40. 1879. = *Achyropappus anthemoides* H. B. K.

- Bahia arachnoidea* Fischer & Lallement. Ind. Sem. Hort. Petrop. 9:63. 1842. = *Eriophyllum lanatum* var. *arachnoideum* (F. & L.) Jepson.
- Bahia artemisiaefolia* Less. Linnaea 5:160. 1830, and 1. c. 6:253. 1831. = *Eriophyllum staechadifolium* Lag.
- Bahia confertiflora* DC. Prodr. 5:657. 1836. = *Eriophyllum confertiflorum* (DC.) Gray.
- Bahia confertiflora* var. *trifida* (Nutt.) Gray. Bot. Calif. 1:380. 1876. = *Eriophyllum confertiflorum* (DC.) Gray.
- Bahia cuneata* Kell. Proc. Calif. Acad. 5:49. 1873. = *Eriophyllum lanatum* var. *cuneatum* (Kell.) Jepson.
- Bahia depauperata* Blake. Brittonia 2:352. 1937. = *Vasquezia depauperata* (Blake) Ellison, comb. nov.
- Bahia depressa* M. E. Jones. Contr. West. Bot. 17:31. 1930. = *Dyssodia micropoides* (DC.) Loes.
- Bahia desertorum* M. E. Jones. Zoe 2:249. 1891. = *Platyschkuhria integrifolia* (Gray) Rydb.
- Bahia Gilliesii* Gray. Proc. Am. Acad. 19:28. 1883. = *Schkuhria multiflora* Hook. & Arn.
- Bahia gracilis* Hook. & Arn. Bot. Beechey Voy. 353. 1838. = *Eriophyllum lanatum* var. *integrifolium* (Hook.) Smiley.
- Bahia integrifolia* (Hook.) DC. Prodr. 5:656. 1836. = *Eriophyllum lanatum* var. *integrifolium* (Hook.) Smiley.
- Bahia integrifolia* (Gray) Macbr. Contrib. Gray Herb. n. ser. 56:39. 1918. = *Platyschkuhria integrifolia* (Gray) Rydb.
- Bahia lanata* (Pursh) DC. Prodr. 5:657. 1836. = *Eriophyllum lanatum* (Pursh) Forbes var. *lanatum*.
- Bahia lanata* Nutt. Pl. Hartweg. 317. 1849. = *Eriophyllum lanatum* var. *grandiflorum* (Gray) Jepson.
- Bahia lanata* Nutt. var. *achillaeoides* (DC.) Gray. Bot. Calif. 1:381. 1876. = *Eriophyllum lanatum* var. *achillaeoides* (DC.) Jepson.
- Bahia lanata* Nutt. var. *brachypoda* Gray. Bot. Calif. 1:381. 1876. = *Eriophyllum lanatum* var. *arachnoideum* (F. & L.) Jepson.
- Bahia lanata* Nutt. var. *grandiflora* Gray. Bot. Calif. 1:381. 1876. = *Eriophyllum lanatum* var. *grandiflorum* (Gray) Jepson.
- Bahia lanata* Nutt. var. *tenuifolia* (DC.) Torr. & Gray. Fl. N. Am. 2:376. 1842. Not *Bahia tenuifolia* DC. 1836. = *Eriophyllum lanatum* (Pursh) Forbes var. *lanatum*.
- Bahia latifolia* Bentham, Bot. Voy. Sulph. 30. 1844. = *Eriophyllum lanatum* var. *arachnoideum* (F. & L.) Jepson.
- Bahia latifolia* Lindl. Jour. Hort. Soc. 8:319. 1853. = *Eriophyllum lanatum* var. *arachnoideum* (F. & L.) Jepson.
- Bahia leucophylla* DC. Prodr. 5:657. 1836. = *Eriophyllum lanatum* (Pursh) Forbes var. *lanatum*.
- Bahia leucophylla* Eaton in S. Wats. Bot. King's Expl., in part. 1871.

- (Illegitimate name.) = *Eriophyllum lanatum* var. *integrifolium* (Hook.) Smiley.
- Bahia multiflora* Nutt. Trans. Am. Phil. Soc. Ser. 2, 7:373. 1841. = *Eriophyllum lanatum* var. *integrifolium* (Hook.) Smiley.
- Bahia neomexicana* Gray. Proc. Am. Acad. 19:27. 1883. = *Schkuhria multiflora* H. & A.
- Bahia nepetaefolia* Gray. Proc. Am. Acad. 5:184. 1861. = *Loxothysanus sinuatus* (Less.) B. L. Robinson.
- Bahia nudicaulis* Gray. Proc. Am. Acad. 19:27. 1883. = *Platyschkuhria integrifolia* (Gray) Rydb.
- Bahia oblongifolia* Gray. Proc. Am. Acad. 19:27. 1883. = *Platyschkuhria oblongifolia* (Gray) Rydb.
- Bahia ourolepis* Blake. Proc. Biol. Soc. Wash. 35:175. 1922. = *Platyschkuhria ourolepis* (Blake) Ellison, comb. nov.
- Bahia palmeri* (Gray) B. D. Jackson. Index Kewensis 1:264. 1895. = *Baeria palmeri* Gray. (Insertion error; formal transfer not intended by Jackson.)
- Bahia palmeri* Wats. Proc. Am. Acad. 24:83. 1889. = *Orochaenactis thysanocarpha* (Gray) Coville.
- Bahia parviflora* Gray, Bot. Calif. 1:382. 1876. = *Eriophyllum ambiguum* (Gray) Gray.
- Bahia resinosa* (H. & A.) DC. Prod. 6:678. 1837. = *Gutierrezia?* sp.
- Bahia rubella* Gray. Bot. Mex. Bound. 95. 1859. = *Eriophyllum Wallacei* Gray.
- Bahia schkuhrioides* (Link. & Otto) Gray. Proc. Am. Acad. 19:27. 1883. = *Schkuhria schkuhrioides* (Link. & Otto) Thellung.
- Bahia sinuata* Less. in Schlecht. & Cham. Linnaea 5:160. 1830. = *Loxothysanus sinuatus* (Less.) B. L. Robinson.
- Bahia staechadifolia* (Lag.) DC. Prodr. 5:656. 1836. = *Eriophyllum staechadifolium* Lag.
- Bahia staechadifolia* var. *californica* DC. Prodr. 5:656. 1836. = *Eriophyllum staechadifolium* Lag.
- Bahia tenuifolia* DC. Prodr. 5:657. 1836. = *Eriophyllum confertiflorum* (DC.) Gray.
- Bahia trifida* Nutt. Trans. Am. Phil. Soc. Ser. 2, 7:374. 1841. = *Eriophyllum confertiflorum* (DC.) Gray.
- * *Basia trolliifolia* (Lag.) DC. Prodr. 5:657. 1836. = *Eriophyllum lanatum* var. *arachnoideum* (F. & L.) Jepson.
- Bahia wallacei* Gray Pac. R. R. Rept. 4:105. 1847. = *Eriophyllum wallacei* (Gray) Gray.
- Bahia wallacei* Gray, Proc. Boston Soc. Nat. Hist. 7:146. 1859. Not *B. wallacei* Gray, 1847. = *Eriophyllum ambiguum* Gray.

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**Bahia*

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ERIGENIA, A GENUS NEW TO OKLAHOMA — While returning from the 1963 spring meeting of The Southwestern Association of Naturalists held in Pittsburg, Kansas, I stopped to study, and collect from, a northern part of Oklahoma Ozark Mountains along Lost Creek near Wyandotte. There I collected a plant which I had not seen before. I subsequently identified it as *Erigenia bulbosa* (Michx.) Nutt. The collection is Wallis 8748, wooded base of hill on Lost Creek, 1 mile east of Wyandotte, Ottawa County. The genus was not found during an earlier study of the region (Wallis, 1959) and has not been reported previously from the state (Waterfall, 1962). It is a genus of deciduous woods of northeastern United States and adjacent Canada, previously known to extend as far southwest as Missouri (Fernald, 1950) and Kansas (McGregor and Horr, 1953).

The same area, within 200 yards of the spot where *Erigenia bulbosa* was collected, has provided three other addi-